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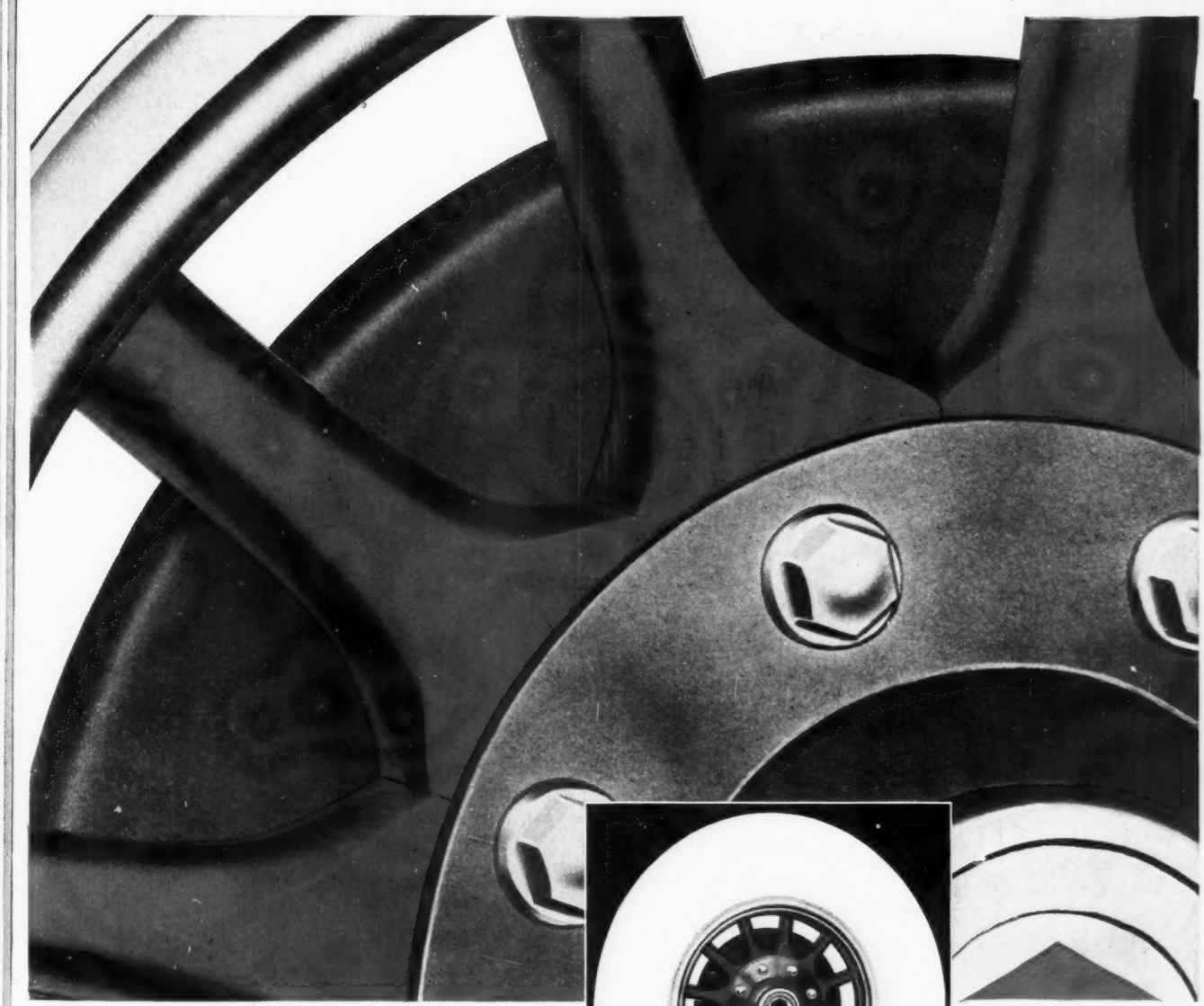

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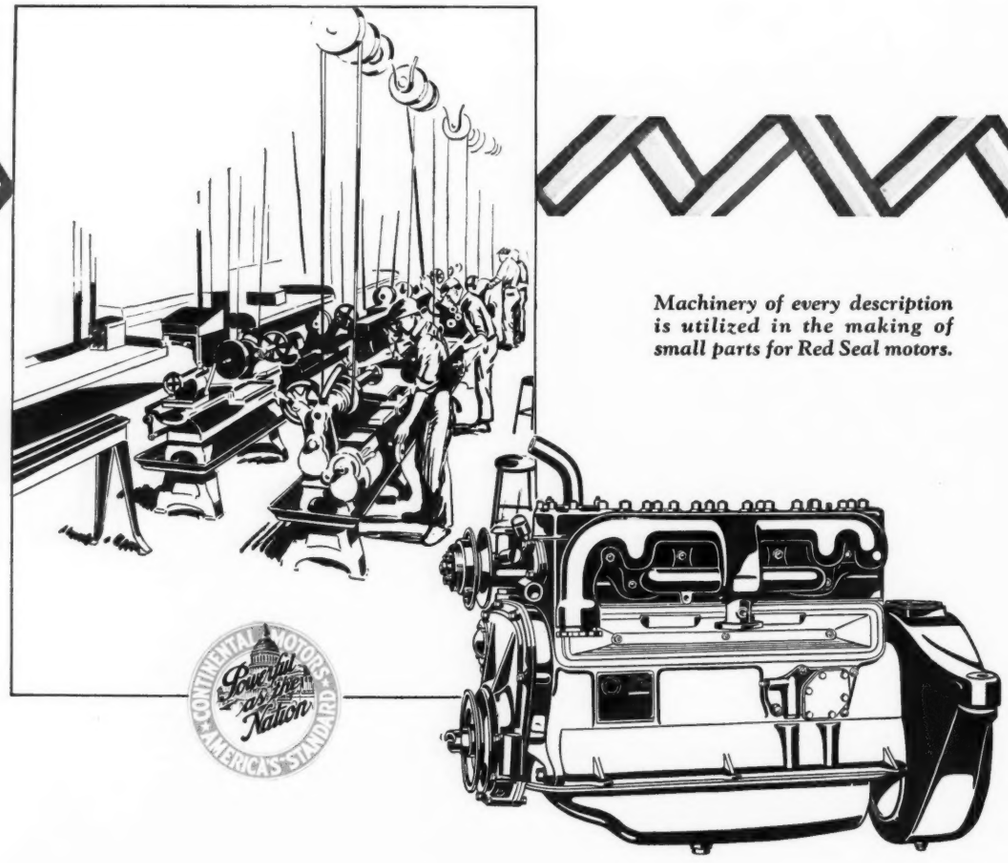

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AUTOMOTIVE INDUSTRIES

VOLUME 57 *Philadelphia, Saturday, December 31, 1927* NUMBER 27

Major Price Changes Unlikely in 1928 Metal Market

Sheet industry effecting important production economies but these have already been discounted largely in advance. Ten per cent shrinkage in 1927 ingot output.

By William Crawford Hirsch

WHAT lessons that may help to guide the automotive consumer of metals in his 1928 buying policies are to be drawn from the market records of 1927?

With an approximate shrinkage of 10 per cent in ingot output, the theoretical yardstick by which the steel industry's activity is measured, and price levels during the year's greater part far from gratifying to producers, 1927 will be rated an off-year in the metal industry's annals.

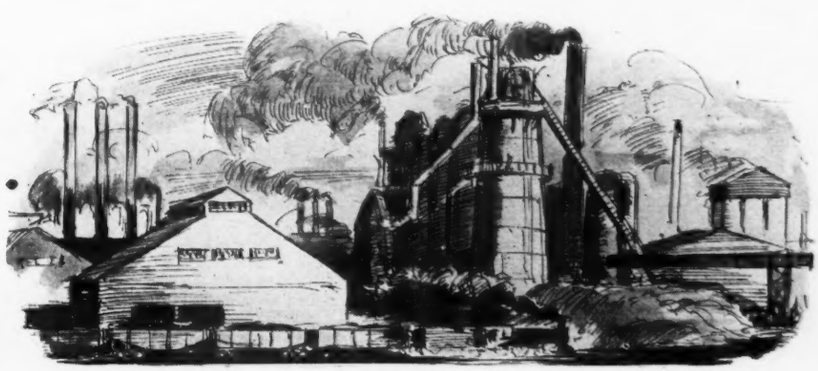
Time and again, one or another steel company executive predicted an early turn for the better, only to have developments prove him wrong. The law of demand and supply, the excess of capacity of finishing mills over consumers' needs, frustrated all efforts to alter the psychology of buyers.

In the sheet market, of primary importance to automotive consumers, the steadily growing application of the continuous rolling method, with its incisive economies, exerted infinitely more pressure on market values than did the "shopping" of buyers.

When statements emanate from responsible engineering sources that "some seven continuous mills could take care of all the sheet rolled today in the United States," the problem of obsolescence which faces most finishing mills at the present time looms above all others.

Consumers sense that the sheet industry is in a state of mechanical transition, and that, for some time to come, complaints that market prices are unremunerative must be expected from producers who have been outstripped by their competitors in the race for mechanical refinements. As matters stand, the same market price may spell a fair margin of profit to one producer and out-and-out loss to another. Mergers, both those which have been consummated and those that are planned, must be judged in the light of the enormous capital investments exacted in the modernizing of steel mills, and cannot be loosely interpreted as being prompted solely by a desire to eliminate competition.

Considering the marked changes that have come over the sheet and strip-steel industry as the result of radical progress in production methods, prices may be said to have moved within very narrow bounds in 1927. Black sheets recorded a high of 3.00 cents, Pittsburgh, in the late spring, the quoted low of 2.75 cents having prevailed at several periods of the year, especially so toward its close, and being shaded $1 or $2 a ton on the occasion of especially competitive transactions.



From this rather sedate price movement it would appear that no sudden or extreme changes in the sheet market's price structure can be looked for as the result of increasing production economies. In part, these have been discounted

in advance, and the heavy expenditures that improved equipment entails serves to discourage haste in this direction on the part of even the strongest interests.

Full-finished automobile sheets, in a class by themselves and not so much exposed to the competitive influence that surround the sheet market as a whole, sold within a range of 4.00 @ 4.25 cents, Pittsburgh, the former low resulting directly from the spirited bidding of mills for the new model Ford body requirements. Non-integrated rollers of full-finished automobile sheets face unquestionably a serious problem in making both ends meet in a 4.00 cents market. Sheet bars, their semi-finished material, sold at between $33.50 and $36, but it was only during a brief period last May that they could contract at $33.50, the $34 price prevailing throughout the greater part of the year.

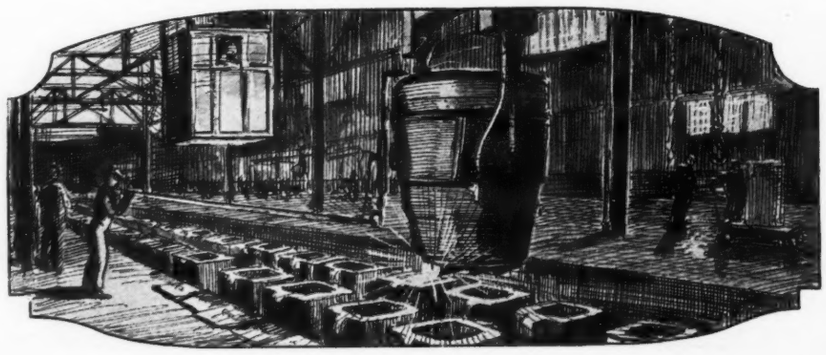
Race May be Too Swift

From day to day it is becoming more and more of an open question whether finishers without their own sheet-bar supply and having to pay a profit to the mills which supply their semi-finished material can remain in the race with those producers whose operations begin either with the mining of the ore or the open-hearth furnace.

That leadership is still a force to be reckoned with in the steel market, making itself especially felt whenever the intensive strife for business breeds unhealthy market conditions, was impressively shown by developments in the market for hot-rolled steel bars a few months ago. Late in September, the market turned decidedly ragged, the 1.75 cents level quoted by some producers for round tonnages having become merely a target for others to shoot at, when one of the leading producers announced a 1.80 cents price, thereby steadying the situation considerably in spite of the paucity of business.

Early in December, the leading "independent" steel company announced a quotation of 1.90 cents, Lackawanna, N. Y., where its bar mill is located. This announcement was interpreted as denoting definite abandonment by this producer of the "Pittsburgh plus" system of price quotations, minimum base prices being named at the same time for plates, f.o.b. Coatesville, Pa., and Sparrows Point, Md., and for shapes f.o.b. Bethlehem and Lackawanna.

Whether this step will lead to the general adoption by the steel industry of f.o.b. mill selling prices remains to be seen. At this writing, the industry's verdict appears to be that the innovation is a welcome experiment. Those who look for a price war to result from it are likely to be disappointed, because, while steel producers may differ on many points, they are all striving for higher prices at this time. Many consumers are approaching study of the effect on their purchases of a change from f.o.b. Pittsburgh to f.o.b. mill in a wary frame of mind, suspecting that the object of the change at this particular time is not so much simplification of marketing methods as the sugar-coating of price advances.



Producers of cold-finished steel bars complained during the greater part of the year of the inadequacy of the spread between hot-rolled bars and their finished product. While the hot-rolled bar market was more or less demoralized, astute contracting for their "raw" material temporarily tided them over the worst conditions, but with the increased firmness of hot-rolled bars they will strive to restore the $10 spread that prevailed between hot and cold-finished bars during the second half of 1925 and the first half of 1926.

Relatively wide price fluctuations featured the strip steel market in 1927. Strip steel producers still have a wide development of uses for their product ahead of them. Competing aggressively with sheets, especially in the automotive industries, makers of strips over 12 in. have at times to meet the competition of plate mills. The interchangeability of strip steel with sheets in many uses suggests, of course, the thought that some day the steel industry will find a common denominator for products serving the same purpose, disregarding the mechanical method by which they are produced. It would seem that fender stock is fender stock, whether it is rolled in a strip mill or a sheet mill.

Automotive alloy steel prices eased off during the latter part of the year. Three and one half per cent nickel steel (S.A.E. 2300) was quoted at $4.00, base, per 100 lb. in December, as compared with $4.35 at the year's beginning, and other alloy steels, with the possible exception of the highest grade of chromium steel, gave way to about the same extent. The alloy steel industry bore, of course, the brunt of the decline in automotive production, but indications of a much better demand began to be noticed about the middle of December.

Automotive foundries fared well in the 1927 pig iron market which declined steadily from the year's very outset, when No. 2 foundry was quoted at $18.50, Valley. Early in December foundries could buy in single car lots at $17.25. Output underwent about the same shrinkage as steel. Competition among blast furnace interests continues keen, and the possibility of foreign competition imposes restraints that give justification for the mood in which automotive consumers contemplate the outlook in the pig iron market.

The copper producers appear to have realized one of their fondest ambitions in 1927. After a protracted period of languishing market conditions, they succeeded in lifting the price for electrolytic well over the 14-cent level, although in the year's final fortnight there was a mild reaction, temporarily bringing prices slightly below 14 cents.

By the side of the now smoothly working export combine, an institute for the better statistical information of producers has begun to function. Aside from the introduction of a new terminology for certain brass and bronze products, the market for the latter followed closely the ups and downs of the raw metal. The general impression among extensive copper consumers is

that higher prices are in the offing, but that those in control of the situation will not permit runaway market conditions to develop.

Some one in the tin market discovered a few months ago that one-fifth of all tin imports find their way into automotive consumption, and since then the tin market has been taking much closer notice of what is going on in the automotive field. Constantly recurring rumors of the formation in London of a "corner" in tin have been effectively spiked, but that does not mean to say that prices may not go considerably higher. Stories of sources of supply given out must be taken with very much of a grain of salt, but there is too snug a fit between demand and supply to make consumers' position comfortable.

Two price reductions, each lowering the price 1 cent per lb. for 98 @ 99 per cent pure virgin metal, which were announced by the sole domestic aluminum producer earlier in 1927, were followed by a cut of 70 points (7/10-cent) during the second half of December, bringing prices to the lowest level since February, 1923. World production has grown by leaps and bounds, and is now probably at the annual rate of 250,000 metric tons, the American producer's new Canadian plant becoming more and more of a heavy contributor to the supply. Importers more than met the last reduction which brought the price down to 25 cents. Increased consumption, especially in light aluminum alloys, by the automotive industries is looked for in 1928. Expansion of the aircraft industry should enhance this consumption further. It would seem that aluminum producers would be more interested in broadening the outlet for their metal in 1928 than in advancing prices which might retard its uses.

For the better part of the year the frequent price changes in lead were in response to foreign market conditions. In some quarters storage battery consumption of lead in 1927 is believed to have fallen off 10,000 tons as compared with 1926. Recent market quotations were the lowest in five years, but the tendency now points toward the market's moderate recovery. Prices in the zinc market ruled quite attractive from the consumer's point of view in 1927. There is in evidence a tendency to build electrolytic plants in close proximity to the northwestern mines, making for decentralization of the industry.

Nickel, in addition to its wide use in the automotive industries as an alloy in nickel steel and nickel-chromium steel, is now finding steadily growing use as a grain-refining medium in foundries. Chromium, aside from its uses as an alloy in steel, is coming to the front as a plating material.

Characteristics of Fuel "Dopes" Investigated

CHARACTERISTICS of anti-knock fuels for internal combustion engines have been investigated at the Agricultural and Mechanical College of Texas, and the results are given in Bulletin No. 34 of the Texas Engineering Experiment Station, of which M. K. Thornton, Jr., and Ray Flagg are the authors.

Various preparations are on the market which are claimed to improve the qualities of gasoline, and in addition special fuels are available which are claimed to have the same inherent qualities. The investigation was undertaken to determine to what extent the preparations possess the qualities claimed for them, especially when used in a Ford or similar engine.

In order to obtain a standard for comparison, runs were made with a standard gasoline having an initial boiling point of 123 deg. Fahr., a 50 per cent of 294 deg. and an end point of 418 deg. One of the dopes tested (referred to as A) contained large quantities of nitro-benzine dissolved in heavy naphtha, the nitrogen content of a sample being 6.8 per cent. This preparation, which had an initial point of 304 and an end point of 450 deg., was added to the gasoline in the proportions of one, two and three pints to 10 gal.

Another preparation, designated Dope B, was found to consist largely of a nitrated hydrocarbon and contained 6.92 per cent of nitrogen. Its boiling range extended from 302 to 520 deg.

In a series of runs denoted by the letter P, use was made of a fuel consisting of cyclo-paraffins, aromatic hydrocarbons and cracked gasoline. It had a boiling range extending from 156 to 430 deg. Finally a series Q was run with a gasoline made from cracked distillate and recommended for use in high compression engines. A lead tetra ethyl solution was used containing 0.12 per cent of lead.

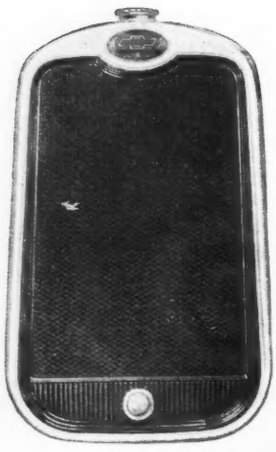
The tests were made on a Ford engine equipped with Kingston carburetor, direct-connected to a calibrated direct current generator. Exhaust temperatures in the manifold at a distance of 2½ in. from the last cylinder were measured by a pyrometer. Cooling temperatures were recorded, the power delivered by the generator was measured and the exhaust gases were analyzed.

Evidently the tests were made as much to check up on some of the arguments made against the dopes as to determine the actual properties of the latter, for in the discussion of the results it is stated that, whereas it has been claimed that with dopes the power would fall off abnormally at high speeds and this drop in power would be accompanied by high temperatures in the exhaust system, the tests did not indicate this to be the case, but, on the contrary, very little difference could be detected, at least within the driving range.

"It has also been assumed," the report continues, "that when fuel dopes are used, the consumption per horsepower-hour will be abnormally high at the higher speeds. The results here obtained indicate that there is little difference throughout the operating range, though in the case of one of the nitrated hydrocarbons when used in the proportions recommended by the distributors, both the power and the economy were improved.

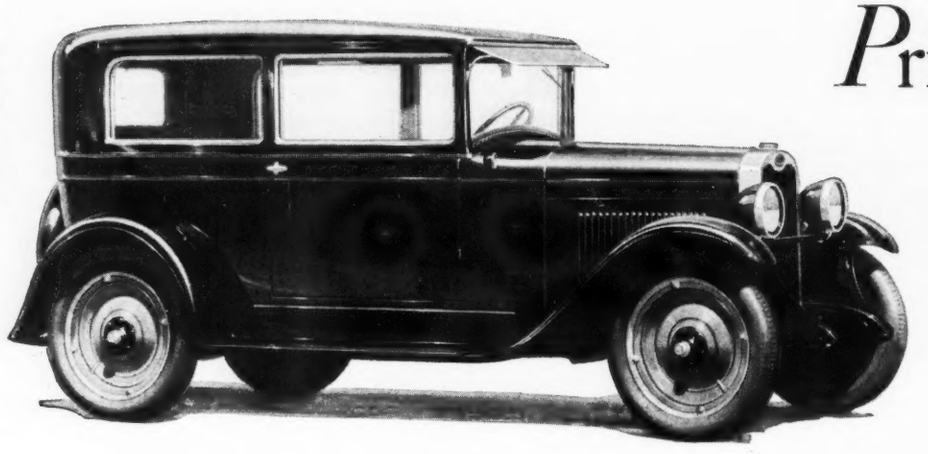
"While it is recognized that the use of 'dopes' and 'doped fuels' will permit changes in engine design that will result in increased economy, with the engine under test and those of similar design, there is little or nothing gained aside from smoother performance.

"The use of these dopes and special fuels increased very materially the smoothness of engine operation at low speeds and under heavy loads, a condition which would contribute very much to the pleasure of driving. They also yield satisfactory operation with the carburetor adjusted for a 'leaner' mixture than with untreated gasolines, but this will result in a loss of flexibility and maximum power and for driving conditions requiring both power and flexibility, a lean carburetor is not to be recommended."



Above—The higher and narrower radiator of the 1928 Chevrolet.

Chevrolet Announces 35 Hp. Price



Right—The new Chevrolet coach with its longer body and wider doors

Higher power obtained by increasing valve diameter and lift, enlarging inlet manifold diameter, using larger jets in carburetor and increasing the compression.

By A. F. Denham

THERE has been considerable speculation during the past few months as to what changes Chevrolet would make for 1928. The announcement has now been made, and reveals a line of bodies decidedly more pleasing to the eye, better performance due to increased engine power, better riding qualities due to a longer wheelbase and to shock-absorbing springs, four-wheel brakes, and mechanical improvements designed to increase the life of the car.

Price reductions are also announced with the introduction of the new line. The touring and roadster models now sell for $495 instead of $525; the coach is $585 instead of $595; the cabriolet has been reduced from $715 to $665; the sedan from $695 to $675, and the landau sedan from $745 to $715. It will be noted that the reductions range from $10 to $50.

The wheelbase has been increased from 103 to 107 in., and while most of the additional length has been taken up by lengthening the cowl, the bodies also have been extended. Thus the inside length of the coach is now 5 in. greater, and that of the sedan, 2¾ in. Further improvement in appearance has been achieved by rounding off the corners of the roof, both at the sides and at the rear, and the higher and narrower radiator gives an aspect of greater fleetness.

Doors on both the sedan and the coach have been made wider, and new color combinations and new interior trims are made use of. The new model is fitted with a neat instrument panel, oval in shape, with three oval instrument groups indirectly lighted. The left unit carries the ignition and lighting switch, the central one the speedometer, and that on the right the ammeter and oil gage. On the extreme right of the panel there is an engraved choke button, which on the closed models, is balanced on the left of the panel by the windshield wiper switch button.

With the increased body space available, both the front and the rear seats have been deepened. Both cabriolet and landau sedan models now also carry the Fisher VV ventilating windshield. On the touring and roadster the taper from top to bottom of the windshield has been increased for better appearance. Colors on all models, and types of upholstery, are tabulated below:

Body Model	Body Color	Beading	Stripe	Upholstery	Upholstery Color
Roadster and Touring	Gray	Black	Gray	Fabric leather	Dark Green
Coach	Green	Black	Gold	Plush	Green
Coupe	Green	Black	Yellow	Plush	Dark Green
Sedan	Green	Black	Gold	Corduroy	Green
Cabriolet	Gray	Green	Gold	Plush	Sage Green
Imperial Landau	Brown	Brown	Gold	Plush	Taupe

Equipment includes an automatic windshield wiper on the closed models, a door pocket in the right front door, a rear-view mirror, a stop-light, and military-type sun visors on the closed models. The coach, sedan and landau also have dome lights, while a foot rest, an ash tray and a robe rail are furnished in the sedan and landau. The headlamps are of new design, with larger rims, although the lenses are unchanged in size.

The engine now develops 35 hp., as compared with the former 26, both at 2200 r.p.m. This gain has been made without increase in cylinder dimensions by increasing the valve diameter from 1½ to 1 21/32 in., increasing the valve lift from 5/32 to 9/32 in., enlarging the inlet manifold diameter by ⅛ in. using larger jets in the carburetor and increasing the compression

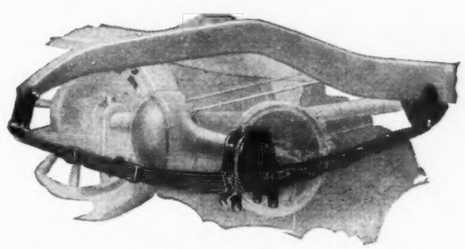
Engine, Four-Wheel Brakes and Reductions

ratio from 4.33 to 4.50. This increase in compression ratio has been obtained by lengthening the pistons above the pin axis. Pistons are now of the invar-strut aluminum alloy type, their lesser weight decreasing engine vibration and improving the acceleration. These pistons carry three 5/32 in. rings above the pin.

Engine changes made with a view toward quieter operation include the provision of two cover plates over the push rods, and a redesign of the cam followers, which now have a diameter of 51/64 in.

From this same point of view the adoption of a fabric camshaft gear is important. The increased valve lift imposes additional stress on the camshaft, and this unit has been strengthened, the shaft itself now being of ⅛ in. larger diameter. Camshaft bearing sizes are as follows: Front, 1 7/16 by 2 21/32 in.; center, 1 11/32 by 2⅛ in.; rear, 1¼ by 1 7/16 in. Except for the fact that the front bearing has been lengthened 3/16 in. to 2½ in., the crankshaft bearings remain of the same size.

Considerable changes have been made in the cooling system, which has had to be materially increased in capacity in view of the much greater engine power.



The new shock-absorbing rear spring

The alloy pistons, of course, dissipate heat more rapidly. The water capacity of the cooling system has been increased by one quart, the radiator being 1½ in. higher but ⅞ in. narrower. Fastened to the inside of the shell is a pressed steel radiator shroud, while a thermostat is incorporated in the water outlet from the engine, a separate casting. The radiator drain cock is now screwed into the bottom outlet, to permit better draining.

Engine cooling is facilitated also by the new two-port exhaust manifold. Crankcase breathing is provided by leading a ½ in. pipe from the front end of the case into the intake manifold.

Of considerable interest is the provision of four-wheel brakes. The external rear brakes are retained in substantially their former form (although the cross shaft at the rear has been eliminated). The front brakes are of the internal two-shoe type, the shoes being formed of pressed steel, pivoted at the bottom on a joint bracket and cam-operated at the top, the cam riding on rollers on the shoes. The cam, moreover, has a floating mounting, permitting it to adjust itself for slight operating variations between the two shoes. An interesting brake effort proportioner is used. It comprises double cross-shafts, amidships linked together by a C-shaped linkage, the side and upper arm being in one piece attached to the cross shaft operating the front wheel brakes; while the lower arm is a pressed steel link actuating the rear wheel brake cross-shaft. The rod from the brake pedal connects to the center of the linkage. It should be noted also that the internal rear wheel emergency brakes are retained as distinct supplementary brakes.

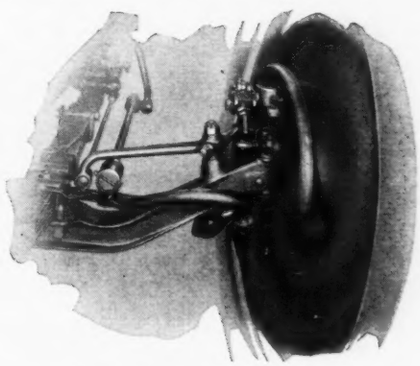
The front axles have reversed Elliott ends, the knuckle pin diameter being increased 3/16 in., to ¾ in., and the knuckles provided with ball thrust bearings. A change has been made also in the steering gear ratio, which is increased from 8 to 9½.

Short leaves with reverse camber in both front and rear springs serve to increase the friction between the main leaves when the spring is deflected. These short leaves thus not only take up the rebound but also help to dampen out any oscillations. The damping leaves are so shaped in the center that the spring clip bolt locates them in place. The effectiveness of this simple addition to the springing equipment in improving the riding qualities of the cars is rather surprising.

Frame Depth Increased

Greater rigidity of the whole car has been obtained by increasing the frame depth from 4½ to 4¾ in., and the flange widths by ¼ in. to 1¾ in., and at the same time providing the lower flange with a lip which extends from the rear to in front of the front frame cross-member. The latter also has been widened for greater strength, while the rear cross-member, which, it will be remembered, is in the form of a wide flanged pan, has been bumped upwards to increase its effective channel depth, thus imparting greater torsional rigidity here also.

With the adoption of 30 by 4.50 in. balloon tires on the new models, rims have been widened from 2 5/16 to 2¾ in. base. There have been other minor changes for greater strength and longer life. The tire carrier is more rigid than formerly. Brake and clutch pedals



Chevrolet front wheel brake

are sturdier. More grease fittings are provided on the steering knuckle assembly.

Longer running boards emphasize the longer body lines, and an improved design of front fender also en-

hances the appearance. The radiator filler cap has been enlarged to 3¼ in. Instrument panels are now colored to harmonize with body colors. Body heading is carried straight through on the cowl and hood, instead of being given a bend on the cowl. Walnut finish door panels are fitted below the windows of the landau. On the touring and roadster the side curtains open with the doors. The top speed of the cars is given as between 50 to 60 m.p.h. The turning radius is 20½ ft.

The commercial chassis is practically identical with that of the passenger cars. One difference of note is that cast-iron pistons are used, of similar design to those previously used. Radiators on the commercial cars are finished in black enamel, whereas those on the passenger cars are of polished aluminum.

On the one-ton truck model, chassis features are the same as in 1927, although the redesigned engine with cast-iron pistons is adopted in this chassis also. The muffler and exhaust pipe assembly on this chassis is identical with that on the passenger cars.

New *Lacquer* Gives *Glossy* Finish Without Polishing

Nitro-cellulose product developed by John L. Armitage & Co. regarded as important step toward obtaining lustrous surface at low cost on production cars.

By K. W. Stillman

SINCE the first employment of nitro-cellulose products as automobile finishes means have been sought for eliminating or greatly reducing, the very considerable amount of hand sanding and polishing necessary to provide a gloss finish which will appeal to a public accustomed to the lustre of varnish. Various methods have been employed, at least experimentally, such as increasing the gum and plasticiser content of the lacquer, applying clear lacquer or varnish top coats, etc.

An important step has been made toward the solution of this problem in the development by John L. Armitage & Co., Newark, N. J., of a gloss lacquer which, without polishing, provides a finish comparable with that obtained on many production cars which have had from one to three hours of polishing.

This new lacquer is a nitro-cellulose product in every way and retains all the characteristics which have made this type of finish so popular both with manufacturers and users of automobiles. Its only difference from other lacquers is that it dries with a glossy surface.

At a recent demonstration arranged for a representative of *Automotive Industries* the results to be obtained with this new product were clearly indicated for, although the conditions under which the demonstration was conducted were far from perfect, a very satisfactory finish was obtained.

An old car was used for the demonstration from which the old lacquer finish was stripped. Lack of time prevented the application of but one surfacer coat so that the resulting surface upon which the lacquer was applied was not in as good condition as might be expected in regular production operations.

The lacquer was sprayed on by a workman who was using this material for the first time and, since methods of application play such an important part in the results obtained with pyroxylin materials, it might be expected that expert workmanship such as is found in most automobile plants would improve the finish.

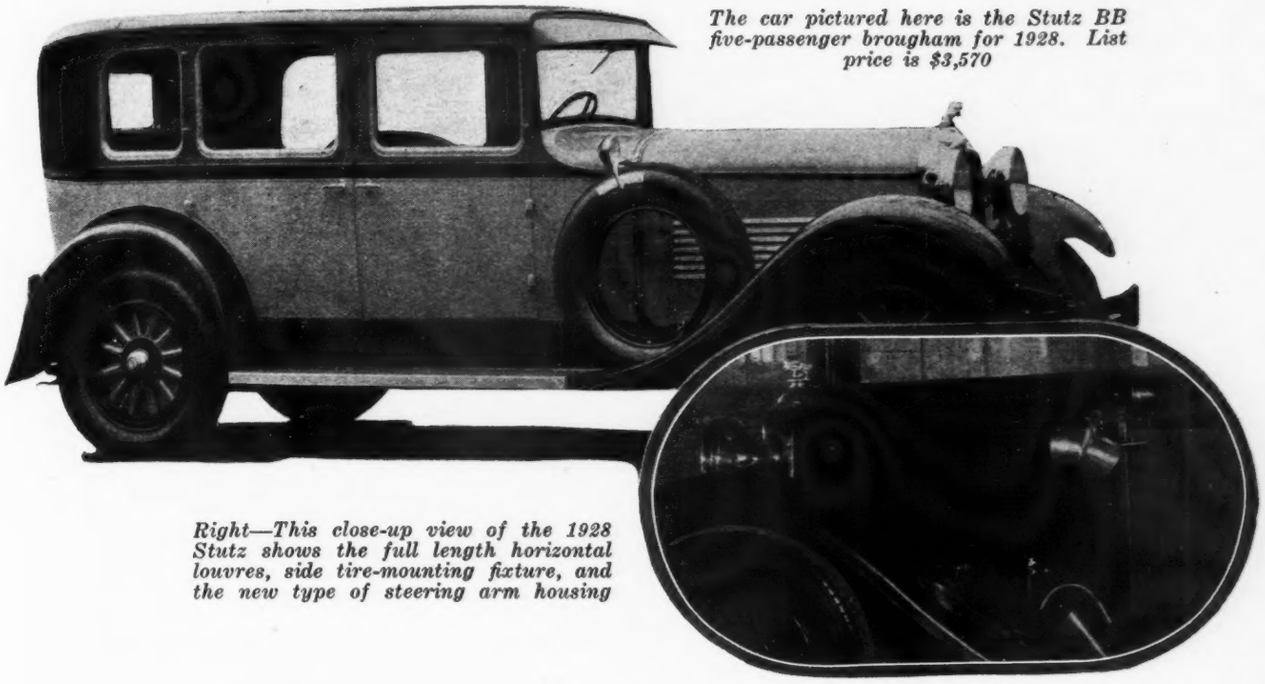
The first lacquer coat was sprayed on rather wet and as the low boiling solvents evaporated the surface took on the same orange peel effect that is obtained with other lacquers. The surface was dry to the touch within a very few minutes after it had been sprayed but the changes occurring after this were particularly interesting.

Apparently, as the high boiling solvents are leaving the finish, the lacquer film contracts, for a marked smoothing out of the orange peel could be clearly seen. About half an hour after the finish had been applied the orange peel had entirely disappeared and the only unevenness of the surface was caused by the sanding marks on the surfacer showing faintly through the thin lacquer film.

The second lacquer coat was applied and the same procedure ensued. While wet and immediately after becoming dry to the touch the finish was orange peeled but within the next few minutes the film seemed to tighten up and smooth out its roughness and when half an hour or more had passed a smooth finish with a very good gloss resulted, in which even the sanding marks had disappeared.

As mentioned before, the gloss obtained is comparable to that found on many low and medium-priced production cars which have been polished for varying periods so that it is expected that manufacturers of such cars will be able to use a finish of this type to entirely eliminate the polishing operations. For higher priced cars, in which a very high lustre is desired, use of such a gloss lustre should enable the makers to reduce considerably the time required for polishing.

Another advantage suggested by the Armitage company is that it should be possible to dispense with one or more coats of lacquer when using the new product. They point out that in polishing a considerable amount of lacquer is removed so that the amount applied to a car must be more than that desired on the finished job. While no detailed comparisons have yet been made, they believe that because none of the gloss lacquer, or a relatively smaller amount, will be removed in polishing, two coats of the new product should do the work of three coats of non-gloss materials.



The car pictured here is the Stutz BB five-passenger brougham for 1928. List price is $3,570

Right—This close-up view of the 1928 Stutz shows the full length horizontal louvres, side tire-mounting fixture, and the new type of steering arm housing

Every Car Distinct in Color is Stutz Policy *for* 1928

No two models to be finished exactly alike. Engine output is increased to 112 hp. at 3800 r.p.m. Dual intake manifold adopted. Bodies are longer and wider.

By M. Warren Baker

UPHOLDING the tradition of custom-built products, every car turned out by the Stutz Motor Car Co. during 1928 will be finished according to an individual color scheme, distinguishing it from every other car of the same type. No two cars will be finished exactly alike. In addition to the adoption of the new color policy, the Stutz company has made numerous changes in its powerplant, in chassis details, in equipment and in body design and fittings. The new line will be known as the Splendid Stutz BB Series.

The bodies have been lengthened 4 in. and widened 2½ in. The top has been flattened, and its highest point (which is barely perceptible) is now at the center, instead of toward the rear, as in the former models. The front of the top has been cut off at a French curve, and a cadet-type visor replaces the former roof extension. The depth of the windshield has been increased 2 in., to increase visibility. While there is no change in the overall height of the car, the head room in the front compartment has been increased.

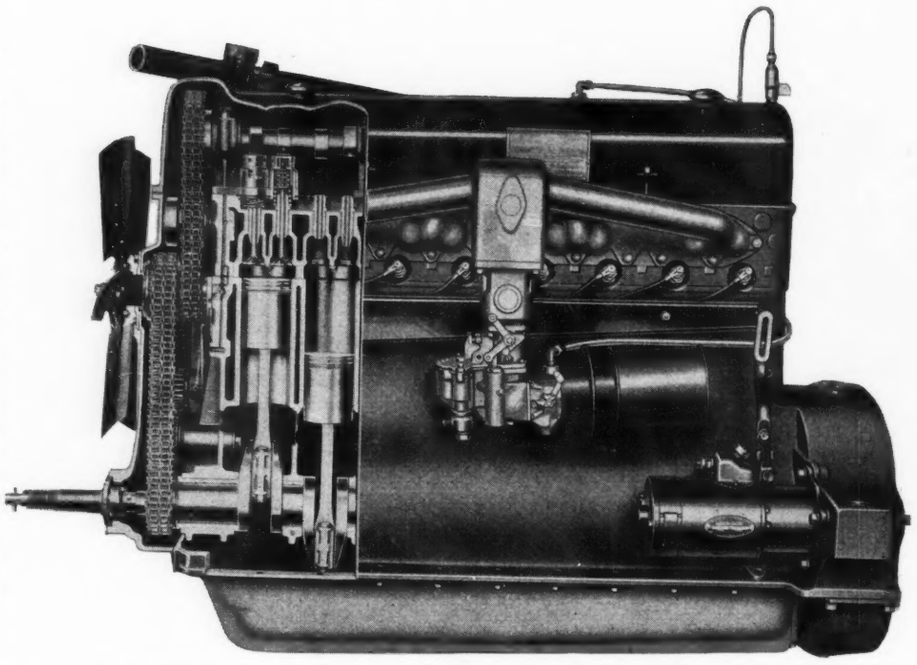
The appearance of the new cars has been improved by the use of full length louvres in the hood, which also add to the facility of air circulation through the radiator.

Although the Challenger-type engine, which has powered the Stutz car for the last two years, has not been changed in its fundamentals, it has been possible, by detail improvements, to raise its output by about 20 hp., the engine now developing 112 hp. at 3800 r.p.m. This gain is due in large part to the use of a dual, ramshorn-type of intake manifold, the passages of which are entirely independent of each other. The outer section feeds cylinders 1, 2, 7 and 8, and the inner section cylinders 3, 4, 5 and 6. A new type dual Zenith carburetor with an acceleration well distributes the gas into both manifold sections. The Autopulse, an electric fuel pump, is standard on the two and four-passenger Black Hawk models and is optional on the

other models in the line.

The cylinder head has been redesigned with water passages between the valves, which are now waterjacketed all around. A compression ratio of 5 to 1 is standard in all models of the new series with the exception of the Black Hawks, which use Bohnalite pistons and have a 5.5 to 1 ratio. The latter piston equipment is optional on other models (regularly equipped with cast-iron piston) and additional special pistons are available for high altitudes where non-detonating fuels are used, giving a compression ratio of 6 and 6.25 to 1.

The adoption of a distributor with an eight-lobe cam and double breakers, and the use of two independent coils assures simultaneous ignition by the two spark plugs operating in each cylinder.



Cut-away view of left side of motor, illustrating overhead camshaft, valve system and water jacketing changes

The shorter wheelbase models now have the larger transmissions previously used only on the seven-passenger chassis. The braking surface of the transmission brake has been increased by about 50 per cent, the diameter of the drum having been increased from 6½ to 8 in. and its width from 2 to 2½ in.

A new type transmission lock is located on the top of the gearshift lever and locks by pushing down the movable ball end of the lever and engaging a small finger catch just below the ball end. Thus the transmission is locked without using the key.

Universal joints are one size larger than previously, and are equipped with a double oil seal. Propeller shafts, formerly 2½ in. in diameter, also have been enlarged, those on the shorter chassis to 2¾ in. and those on the 145 in. wheelbase chassis to 3½ in. Factory inspection calls for 4000 r.p.m. of the seven-passenger-type shaft without whip, and 4200 r.p.m. of the shorter shaft.

Both axles are now of sturdier design. The walls of the knuckle pin bushing have been doubled in thickness, and the pins have been increased in diameter from 13/16 in. to 1 in. The inclination is 7½ deg. The knuckle pins are still lubricated by the Myers system used throughout the chassis, but Alemite fittings are provided on the tie rod. Wheel spindles now are given 1 deg. of camber, which is said to add to tire life. The tie rod is of new design; it is larger than before and has right and left threads at both ends, to permit of making close adjustments. A cushion spring of greater strength is placed in each joint of the tie rod, and is designed not only to act as an anti-rattler, but also to damp out shimmy. The inner end of the wheel hub is extended into an oil baffle pocket, to keep the lubricant away from the brake drum.

The 131-in. wheelbase chassis now has the same rear axle as the longer chassis. Front axles also are now the same on both chassis, with the exception of 1 in. difference in the center drop, which gives both models the same road clearance.

Slight changes have been made in the differential, to increase its rigidity and to reduce the backlash. The differential carrier is now made in two pieces instead of four, and the differential housing is riveted instead of being bolted together. A double oil seal is provided at the ends of the axle housing to protect the brake drums from oil.

Lockheed internal expanding brakes with an automatic compensating device are now used as standard equipment. The brake drums are 16 in. in diameter, which is the largest size in which Lockheed internal brakes have been used for passenger automobiles so far. The outer rim of the brake drum is flanged.

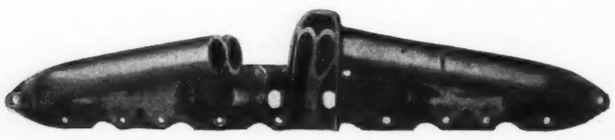
Ther-mo-cool equipment has been added as standard on all models except the Black Hawks, on which it is optional. The back pressure in the exhaust line has been reduced by enlarging the tail pipe, so that there is now a speed difference of only about 1 m.p.h. with the cut-out open and closed.

Front wheels are now interchangeable on all models. All wire wheels are closely balanced and are fitted with cup washers to make it possible to obtain an accurate balance whenever adjustment is required. Lovejoy shock absorbers are fitted at both front and rear, with a double check strap on the rear.

A new type steering wheel with small-section, rubber-covered steel rim and a diecast black-enameled aluminum spider constitutes the only change in the steering gear.

Another innovation is that the lower line of the hood follows the front drop of the frame and is not cut horizontal at the bottom to rest on the usual box-like steering arm case. An oval top housing over which the hood is cut accommodates the steering arm.

Tires are side-mounted in fender wells. The nickeled cowl band to which the tire mounting fixtures are attached also carries the cowl lamps. The fenders are 1½ in. wider and are full crowned. A trunk rack is provided at the rear. The new models have the instru-



Sectioned view of new Stutz dual intake manifold

ment group set in a panel of oxidized etched silver. In the panel are the speedometer, engine heat indicator, oil pressure gage, ammeter, clock and gasoline gage. The instruments are lighted from within the panel case by two bulbs giving a glareless light and providing luminous dials. The entire floor and the lower part of the front compartment are illuminated by the same means.

Headlamps are now of the foreign type, with double filaments, the cowl lamps being of like appearance. There are individual bulbs and lenses for the combination tail-light, parking light and backing light.

Genuine walnut is used throughout for the interior wood trim. The cowl panel and instrument board are of black walnut and the window and door trim sticks are of burled walnut. The hardware on all models is the same as that formerly used in the custom body line only. Saddle-back type upholstery is employed for the back and seat cushions. The broadcloths and mohairs formerly used only in the custom and Weymann bodies are now standard throughout the line.

Stutz is announcing 12 conventional type body models, 10 new models in the Weymann custom line, certain body variations in the standard line and custom bodies by LeBaron and Fleetwood. The list includes:

CUSTOM TYPES

Two-pass. cabriolet coupe, 131 in. w.b.	$3,695
Two-pass. speedster, 131 in. w.b.	3,495
Four-pass. speedster, 131 in. w.b.	3,595
Four-pass. speedster (with tonneau cowl and windshield) 131 in. w.b.	3,845
Five-pass. sedan, 131 in. w.b.	3,570
Five-pass. brougham, 131 in. w.b.	3,570
Seven-pass. sedan, 145 in. w.b.	3,895
Seven-pass. sedan-limousine, 145 in. w.b.	3,995
Victoria coupe, 131 in. w.b.	3,495
Two-passenger coupe, 131 in. w.b.	3,495
Two-pass. Black Hawk speedster, 131 in. w.b.	4,895
Seven-pass. speedster, 145 in. w.b.	3,895
Four-pass. Black Hawk speedster, 131 in. w.b.	4,945

WEYMANN CUSTOM TYPES

Deauville, four-pass. 131 in. w.b.	4,120
Chantilly, five-pass. sedan, 131 in. w.b.	4,120
Monaco, four-pass. coupe, 131 in. w.b.	4,120
Riviera, five-pass. landau sedan, 131 in. w.b.	4,420
Two-pass. Faucon Noir (Black Hawk), 131 in. w.b.	4,895
Biarritz, five-pass. sedan, 145 in. w.b.	4,495
Chamonix, five-pass. sedan, 145 in. w.b.	4,545
Fontainebleau, seven-pass. sedan, 145 in. w.b.	4,745
Aix-Les-Bains, seven-pass. limousine, 145 in. w.b.	4,995
Versailles, seven-pass. landau limousine, 145 in. w.b.	5,295

SALON CUSTOM TYPES

Five-pass. Prince of Wales (LeBaron) 145 in. w.b.	6,345
Seven-pass. Prince of Wales (LeBaron) 145 in. w.b.	6,345
Transformable town car (Fleetwood), 145 in. w.b.	6,895

CHASSIS

Five-pass. (131 in. w.b.) chassis without cowl, windshield, etc.	2,995
Five-pass. (131 in. w.b.) chassis with cowl, windshield, etc.	3,045
Seven-pass. (145 in. w.b.) chassis without cowl, windshield, etc.	3,195
Seven-pass. (145 in. w.b.) chassis with cowl, windshield, etc.	3,460

Products of Automotive Interest at Power Show

POINTS of contact between the powerplant equipment industry and the automotive industry were apparent on every hand at the sixth annual power show held this month in Grand Central Palace, New York, All of the manufacturers of anti-friction bearings were represented. The ball and roller bearing industries have grown to their present sizes largely through the demands of the automotive industry, but now they find greater and greater outlets for their products in the industrial fields. Gear and chain manufacturers also were on hand in considerable number.

A number of continuously variable speed transmissions, comprising expanding and contracting pulleys connected by a special type of belt, were shown. This type of transmission was at one time proposed for use on automobiles, but proved to be too heavy and bulky for that purpose, while in industrial work where continuous variation of speed is desirable it seems to have met with successful application.

Flexible couplings are used to a considerable extent in power transmission, and many samples were shown. In some instances the degree of flexibility was very strikingly demonstrated by moving the free end of the driving electric motor by means of a crank mechanism while the driven shaft was supported in rigid bearings.

Illuminating apparatus for uses where the same quality of lighting as diffused natural light is required was exhibited by Sunlike Illuminating Co. of New York. Correction of quality of light is accomplished by means of reflection from cobalt-oxide-colored graphite glass mirrors, whereby the loss of luminosity which occurs when heavy ray filters are used is avoided. Such artificial light is being used where color discrimination is important or eye strain must be avoided.

A pipe line filter for lines on which compressed air tools are being operated was shown by the Staynew Filter Corp. of Rochester, N. Y. It consists of the well-known Protectometer in a form suitable for this class of work and is claimed to remove oil, water, iron rust, pipe scales and other foreign matter from the air passing through the pipes, hence reducing wear of the tools operated on the line.

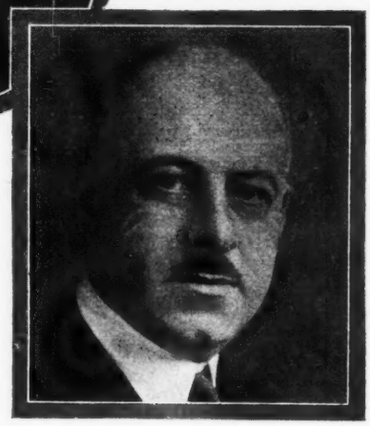
A type of heating element similar to an automobile radiator seems to be coming into use for industrial heating and was shown at the exhibition by a number of firms. It is known as a unit heater and is made up, as a rule, of finned tubes through which the steam is passed. In some designs air is blown through the spaces between the tubes, and with both the steam and the air circulating rapidly, a great heating effect is obtained from a small unit. The unit can be built into the wall and the space ordinarily occupied by radiators thus saved. Up to the present these unit heaters have been used mainly in industrial plants, but smaller and more attractive designs are now being developed for use in residences.

Two internal combustion engines of the automotive type were exhibited. One was the Michell swashplate engine developed by Crankless Engines, Ltd., of Melbourne, Australia, which was shown in an eight-cylinder type developing 55 hp. at 2000 r.p.m. Perfect balance and high efficiency are claimed for this engine. Some 60 Michell machines have been built or are under construction, and the engine is said to have seven years of intensive research behind it.

The other was the Bronander two-stroke, scavenging and supercharging oil engine, which is being built by the American Machine & Foundry Co. of Brooklyn, N. Y. A six-cylinder automobile type of this engine has been built, of 2¾-in. bore and 5-in. stroke and is said to weigh 341 lb., the output being 30 hp. at 1000 r.p.m. This engine is said to have been run up to 2800 r.p.m., at which speed it developed 66 hp. At the present time the engine is being built as a full Diesel engine of from 50 to 450 hp., the bores varying from 2¾ to 4½ in. and the cylinder number from two to 12.

Famous

The four Firestone brothers, sons of Harvey S. Firestone, have their own polo team. From left to right, they are: Leonard, Harvey, Jr., Raymond and Russell. Harvey, Jr., and Russell are already associated with their father in the rubber business and the other two may be expected to join him as soon as they finish school



There are four Kissel brothers. Two of them, George A. (above) and W. L. (right) are shown here. They are the chief executive officers of the Kissel Motor Car Co.

ANYONE setting out to compile an "Automotive Who's Who in America" would discover before progressing very far that a surprisingly large number of brothers were entitled to a place in the work.

As pointed out in the first part of this article, which appeared in last week's issue, brothers have played an important part in automotive development since the earliest days of the "horseless carriage," and although other industries have also had their famous brother combinations, it is doubtful if any can produce such an array as has contributed to automotive history in the last 30 years.

Mention was made in the previous instalment of the seven Fishers, the two Dodges, the three Grahams, the five Widmans, the two Stranahans, the three Whites, the three Jewetts, the five Studebakers, the four Kissels, the two Marmons, the two Duesenbergs and the two Crawfords. Those names alone make a formidable list, but there are many others.

Two Jeffery brothers, Charles and Harold, succeeded to the control of the Rambler automobile plant following the death of their father, Thomas B. Jeffery, in 1910. Later they changed the name of the car to the Jeffery. The business was sold to Charles W. Nash in 1916.

Russell E. Gardner, Jr., and his brother Fred W. are at the head of the Gardner Motor Co. of St. Louis, the former as president and the latter as vice-president and treasurer.

The Fageol brothers, W. B. and F. R., are Pacific Coast products who have become famous for their motor buses. They gained their first foothold in the industry by building the gasoline sight-seeing cars which were used at the Panama-Pacific Exposition in 1915. In 1917 they introduced a high-priced passenger car at the Chicago Salon. They planned to put this car in regular production but the United States entered the war and they switched to commercial vehicles. Their bus business reached national proportions a few years later, following a successful invasion of the eastern market. Recently they disposed of their eastern marketing rights to the American Car & Foundry Co., and have since organized the Twin Coach Corp. to build a new

Automotive Brothers [*Part II*]

Surprisingly large number entitled to place in American "Automotive Who's Who" for part they have played in development of the industry.

By R. L. Cusick

bus of the street car type at Kent, O. They still operate the Fageol Motors Co. at Oakland, Cal.

The business of the John Warren Watson Co. of Philadelphia, manufacturer of Watson Stabilators, is conducted by John Warren Watson, who invented the device and organized the company, and his brother, Richard A. Watson. The former is president and the latter treasurer and general manager.

Another Philadelphia concern, the L. H. Gilmer Co., which makes a line of automobile fan belts, transmission lining and upholstery cloth, is headed by L. H. Gilmer, while a brother, G. Walker Gilmer, is a director.

The Davis brothers—George W. and Walter C.—are the prime movers behind the Davis Motor Car Co., of Richmond, Ind., George W. being president and general manager and Walter C., secretary and treasurer.

H. H. and W. R. Timken of the Timken Roller Bearing Co. and the Timken-Detroit Axle Co. are brothers. They are sons of the late Henry Timken, a pioneer carriage builder who turned to the manufacture of roller bearings and automobile axles. When he divided his interests into two companies in 1909 he placed H. H. at the head of the roller bearing company and W. R. took charge of the axle company.

Interested in the organization and management of the Brown-Lipe Gear Co. were two Lipe brothers, Charles E. and William C. The former died in 1905 and the latter in 1924.

C. B. Wilson, president, and D. R. Wilson, vice-president and general manager of the Wilson Foundry and Machine Co., a subsidiary of the Willys-Overland Co. which manufactures engines for the Willys-Overland cars, are brothers.

Frank and B. Perry Remy, brothers, were the first American manufacturers of ignition magnetos. They worked together in the development of the business which is now a part of the Delco-Remy Corp., a unit of General Motors.

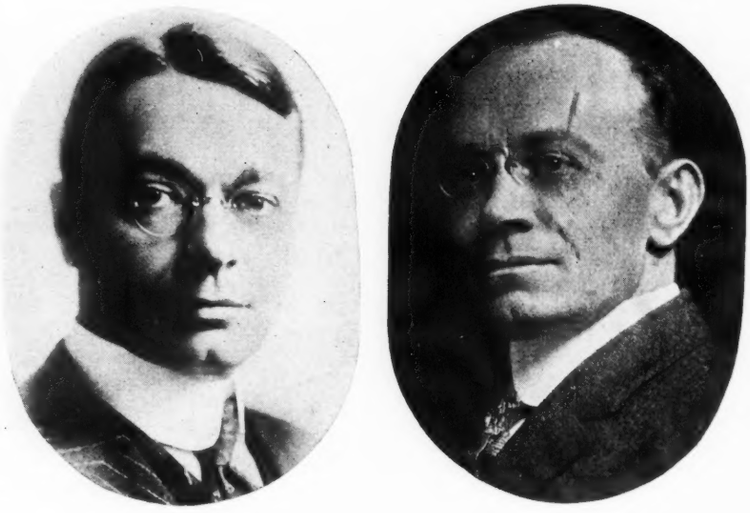
Among the first successful motor truck manufacturers were the Mack brothers, J. M. and J. C., who began in 1902 to produce a truck designed by J. M. They organized the Mack Brothers Motor Car Co. at Allentown, Pa. Later they sold out to the International Motor Co., and afterwards formed the Maccar Truck Co., at Scranton, Pa.

Above are the three Davidson brothers who manufacture the Harley-Davidson motorcycle. William is seen at the upper left in the layout; Arthur, upper right, and Walter, bottom

Right—The five Studebaker brothers; left to right, Clement, Henry, Jacob Franklin, Peter Everst and John Mohler Studebaker

The old Elmore two-cycle automobile, which was taken into the General Motors family in 1910 and later discontinued, was the creation of two brothers, James H. and Burton A. Becker. They started to manufacture the car in Clyde, Ohio, in 1899, as Becker Bros. In 1901 the corporate name was changed to the Elmore Mfg. Co.

The Owen brothers, Ralph R. and Ray M., built the Owen car back in the old days and later produced the Owen Magnetic. Before going into business for himself Ralph Owen was factory manager of the Olds Motor Works.



The Marmon brothers, Howard (left) and W. C.

Among the earliest automotive pioneers were Charles E. and J. Franklin Duryea. These brothers also drifted from bicycles to "horseless carriages" and their first car was built in 1892. The Duryea was a famous car in its day. J. Franklin later played an important part in the development of the Stevens Duryea.

The Apperson brothers, Elmer and Edgar, also qualify for a place among the pioneers of the industry. They opened a machine shop in Kokomo, Ind., in 1888. In 1898 Elwood G. Haynes came to them with the plans of an automobile which he had designed and this resulted in the formation of the Haynes-Apperson Automobile Co. A few years later the Appersons withdrew from this company and formed another, of which they were the sole owners, known as Apperson Bros.

As mentioned before, F. E. and F. O. Stanley, of early steam car fame, were more than brothers—they were twins. The present Locomobile Co. was organized to build the first car they designed. They later started another company which built steam cars up until a few years ago.

In the Harley Davidson Motor Co., manufacturer of motorcycles, there are three Davidson brothers, Walter, who is president and general manager; William, vice-president and works manager, and Arthur, secretary and sales manager.

The Autocar Co. was established by three Clarke brothers, Louis S., John S., and James K. The firm was first located in Pittsburgh as the Pittsburgh Motor Vehicle Co. Later the name was changed to its present form and in 1900 the company moved to its present site in Ardmore, Pa. In 1911 production of passenger cars was discontinued and the business reorganized for the manufacture of trucks only.

The two Packard brothers, J. W. and W. D., laid the foundation of the present Packard Motor Car Co. The brothers evolved a number of original ideas which they incorporated in the first machine which they completed on Nov. 6, 1899. These features included the "H" shift gear lever, automatic spark control and even some of the present-day frame construction was covered by their early patents. The Packards interested George L. Weiss and W. A. Hatcher, who had been associated with Winton, and they went into partnership Dec. 30, 1899, forming the Ohio Automobile Co.

In 1902 the name of the company was changed to the Packard Motor Car Co. A number of Detroit men who were interested in making a connection in the automotive industry became associated with the Packards and the company was moved to Detroit in 1903. J. W. Packard became president of the reorganized company. Up until the time of their retirement several

(Continued on page 981)

F. R. Fageol, who is in the motor coach manufacturing business with his brother, W. B. Fageol

Whom Have We Missed?

THIS instalment completes the list of famous automotive brothers as far as it has been practicable to compile it. We don't pretend it is complete. In several cases, for instance, brothers who are known to have been associated in automotive projects are not mentioned because of the difficulty of obtaining accurate data as to names, numbers, exact business affiliations, etc. We should like, however, to make the list complete and if any of our readers can supply additional names which ought to be included we shall be glad to hear from them.—*Editor.*

H. H. Timken. He and his brother, W. R. Timken, built up the Timken roller bearing and axle business

Method Suggested for Determining *Static Loads* on Bus Bodies

Loads occurring at points of fastening body to chassis are usually indeterminate because of multiplicity of such fastenings. Problem is to prevent tension.

By Charles B. Norris and Joseph A. Potchen*
The Haskelite Mfg. Co., Grand Rapids, Mich.

THE static loads upon bus bodies obviously can be divided into two groups—those due directly to the weight of the passengers and those due to the interaction of the body and the chassis. The latter loads occur at the points of fastening of the body to the chassis and are usually intermediate because of the multiplicity of these points. It is the purpose of this paper to point out the importance of these loads and to suggest a method by which they may be determined.

The usual bus body design provides posts between the windows, spaced at 30 to 40 in., longitudinal members fastened to the tops and bottoms of the posts extending the full length of the bus body, and other longitudinal members fastened to the posts just above and below the windows and extending the full length of the bus body upon the left side and between the front and rear door upon the right. The rectangular spaces formed by this framework above and below the windows are paneled with some suitable material. This paneling is an effective cross bracing and gives the body great stiffness.

The usual chassis frame design provides two longitudinal members (usually of channel cross section) fastened together by several transverse members. The longitudinal members are usually from 4 to 6 ft. apart and are overhung by the bus body. Usually the bus body is supported at the foot of each post by short transverse cantilever beams or "outriggers" which are securely fastened to the longitudinal members of the chassis frame.

From an examination of the design one would suppose that the outriggers were intended to carry that part of the passenger load placed directly above them. This intention is realized only if the stiffness of the bus body is small, compared to that of the chassis frame. A design fulfilling this condition does not seem practical. Either the chassis frame would have to be extremely stiff or the bus body would have to be very flexible indeed. L. C. Josephs, Jr., of the International Motor Co., has lately pointed out several objections to both of these conditions.

He also mentions that general practice in bus body design is quite contrary to them, the stiffness of the average body being about six times the stiffness of the chassis frame upon which it is mounted. Evidently the above intention is not realized in the average bus. The passenger load distributes itself among the outriggers in a way determined by the elastic properties of the structure. Usually the chassis frame acts as a beam supported at the wheels. The bus body rests upon this beam and extends over the rear support but does not reach the front support. If all outriggers are removed except those over the rear wheels and those at the front edge of the body, the problem becomes a very simple one.

The chassis bends concave upward, because of the load placed upon it by the front edge of the bus body. The bus body also bends slightly concave upward, due to the passenger load within it; but the body is so much more rigid than the chassis that its curvative is much less than that of the frame. Thus the vertical distance between the chassis frame and the body near the center of the body is greater when the bus is loaded than when it is empty. If the outriggers which we have assumed removed were left in place they would tend to hold the chassis frame at a constant distance from the body throughout its length. and, therefore, some of the fastenings would necessarily be in tension. The chassis frame would be pulling downward upon the body at these points.

Two methods of overcoming this difficulty suggest themselves. The bus may be designed like the old two-wheel ox cart. The engine and front wheels take the place of the ox and the rear wheels carry the entire passenger load. The bus body and the chassis frame

TABLE I

Deflections of the Longitudinal Members of the Chassis Frame

	Deflections of left side in inches							
Distance from front in inches	0	55	92	130½	180	220¾	286½	306½
Load in lb.								
1920	0	0.028	0.034	0.037	0.030	0.022	0	0.020
3600	0	0.054	0.065	0.074	0.062	0.053	0	0.044
5280	0	0.074	0.085	0.095	0.079	0.071	0	0.057
	Deflections of right side in inches							
Distance from front in inches	0	53	94	131	179	222	286½	307½
Load in lb.								
1920	0	0.002	0.006	0.007	0.001	0.009	0	0.018
3600	0	0.005	0.012	0.014	0.003	0.013	0	0.032
5280	0	0.008	0.017	0.020	0.003	0.019	0	0.038

* Paper presented at the National Meeting of the Wood Industries Division, A.S.M.E., Grand Rapids, Mich.

both bend convex upward due to the passenger load. If the body is six times as stiff as the frame the outriggers near the fastenings of the rear spring carry about six-sevenths of the passenger load, the rest being distributed among the remaining outriggers. The second method is more unusual and has only lately been adopted by a few builders. The bus body is extended the full length of the chassis and the engine is mounted somewhere under the body instead of in front of it. In this case (assuming again that the body is six times as rigid as the chassis) six-sevenths of the passenger load is carried by these outriggers near the spring fastenings of both front and rear springs, one-seventh of the load being divided among the remaining outriggers.

Even if the above methods are employed one cannot be sure that the loads upon all the outriggers are downward, unless the ratio of the stiffness of the body to that of the chassis frame is the same at all transverse sections of the bus. This condition is difficult to meet because the door openings, etc., cause a variation in the stiffness of the body and the "kick up" over the rear wheels a variation in the stiffness of the chassis. It seems best to design with this condition in mind; build a sample body and determine from it the actual reactions between the body and the chassis. If some of the outriggers are found to be pulling downward upon the body, they can be removed and the bus retested to determine the result. If several of the outriggers are found to be pulling downward upon the body and only a few supporting it, the removal of these few may reverse the load upon the remaining outriggers and distribute it more equally.

The method of tests proposed by the authors consists of two steps: First, a test upon the sample bus, and second, a physical analysis of the data obtained. In the test upon the bus attention is focused on the longitudinal members of the chassis, because their strength properties are usually known. The tests consists of noting the changes in the deflection curves of these members due to the application of the passenger load. The points of application of direct loads to these members, such as spring fastenings, outriggers, etc, are noted and recorded. At least one deflection reading is taken for each load, but not necessarily at the point of application of the load. The greater the number of points at which deflection readings are taken the more nearly accurate will be the determination of the loads.

A physical analysis of this deflection data may be obtained by loading a model beam in such a way that its deflections are proportional to the deflection readings taken from the longitudinal members of the chassis. This analysis is first applied to the data taken upon one of the longitudinal members and then to the data taken upon the other. The model beam should be made so that the ratio of its stiffness to the stiffness of the longitudinal members of the chassis is the same for the corresponding sections. Also the loads should be applied to the model beam at points corresponding to the points of application of loads upon the longitudinal members. The loads obtained in this manner are proportional to the loads upon the longitudinal members of the chassis frame due to the application of the passenger load. Therefore, if the total passenger load used in the bus test is known, the loads upon the chassis can be determined from the loads upon the model beam by a simple proportion.

Let us now consider some data taken in a test. The bus was run over a pit in the factory and a heavy wooden beam extending its full length hung under it. This beam was supported by wires fastened to the chassis at the front of the front springs and at the rear of the rear springs. Lighter transverse beams were fastened to it. These beams supported arms at their ends which held Ames dials against the under surface of the longitudinal members of the chassis. Sand bags were used for the passenger load. The deflection data obtained are shown in Table I.

The model beam used by the authors was made of poplar veneer, ¼ in. in thickness and one-fourth the length of the longitudinal members of the bus chassis. Its width varied in such a manner that its stiffness at any section was proportional to the stiffness of the longitudinal chassis members at a corresponding section. The loads were applied to this model beam by means of

TABLE II

The Forces on the Model Beam

	R_1	R_1	P_1	P_2	P_3	P_4	R_2	R_2	P_5	P_6
Distance from front in ¼ in.	0	50	88	125	185	219½	226½	286½	289½	338½
Forces when model beam conforms with deflection curve of left side —in grams	—45	—45	189	—35	—575	1984	—979	—979	0	451
Forces when model beam conforms with deflection curve of right side—in grams..	—4	—4	—146	200	91	1302	—1272	—1272	717	385
Forces upon left side expressed in per cent of reactions on left side.	—2.2	—2.2	9.6	—1.4	—28.1	97.3	—47.8	—47.8	0	22.6
Forces upon right side expressed in per cent of reactions on right side	—0.4	—0.4	—7.3	8.1	3.6	51.8	—49.6	—49.6	28.5	15.3

TABLE III

The Forces Upon the Chassis Frame Due to the Passenger Load

	R_1	R_1	P_1	P_2	P_3	P_4	R_2	R_2	P_5	P_6
Distance from front of bus to point at which force is applied — in inches	0	50	88	125	185	219½	226½	286½	289½	338½
Forces on left side, expressed in per cent of passenger load	—1.1	—1.1	4.8	—0.7	—14.1	48.7	—23.9	—23.9	0	11.3
Forces on right side expressed in per-cent of passenger load	—0.2	—0.2	—3.7	4.1	1.8	25.9	—24.8	—24.8	14.3	7.7
Forces on left side at full passenger load of 5280 lb.	—58	—58	254	—37	—745	2570	—1262	—1262	0	597
Forces on right side of full passenger load of 5280 lb.	—11	—11	—195	217	95	1370	—1310	—1310	755	407

twine and rubber bands. A sheet of drawing paper on which the deflections of the longitudinal members of the chassis frame were plotted was fastened to a blackboard. The model beam was held in front of this paper by twine and rubber bands as shown. The tension on the rubber bands was varied until the model beam was made to conform to the plotted deflection curve of one of the longitudinal members. The length of each of the rubber bands was then recorded and the test repeated for the other longitudinal member. Subsequently the forces applied by the rubber bands were determined by loading each band separately with gram weights so that the recorded length was again obtained. These weights corrected for the dead weight of the model beam are given in Table II. The loads on the chassis frame due to the passenger load can be determined from these weights by the following simple proportion:

$$\frac{\text{The load at a specific point on one of the longitudinal chassis members}}{\text{half the passenger load}} = \frac{\text{The corresponding load on the model beam}}{\text{The sum of those loads on the model beam which correspond to the loads applied by the bus springs to the longitudinal chassis member.}}$$

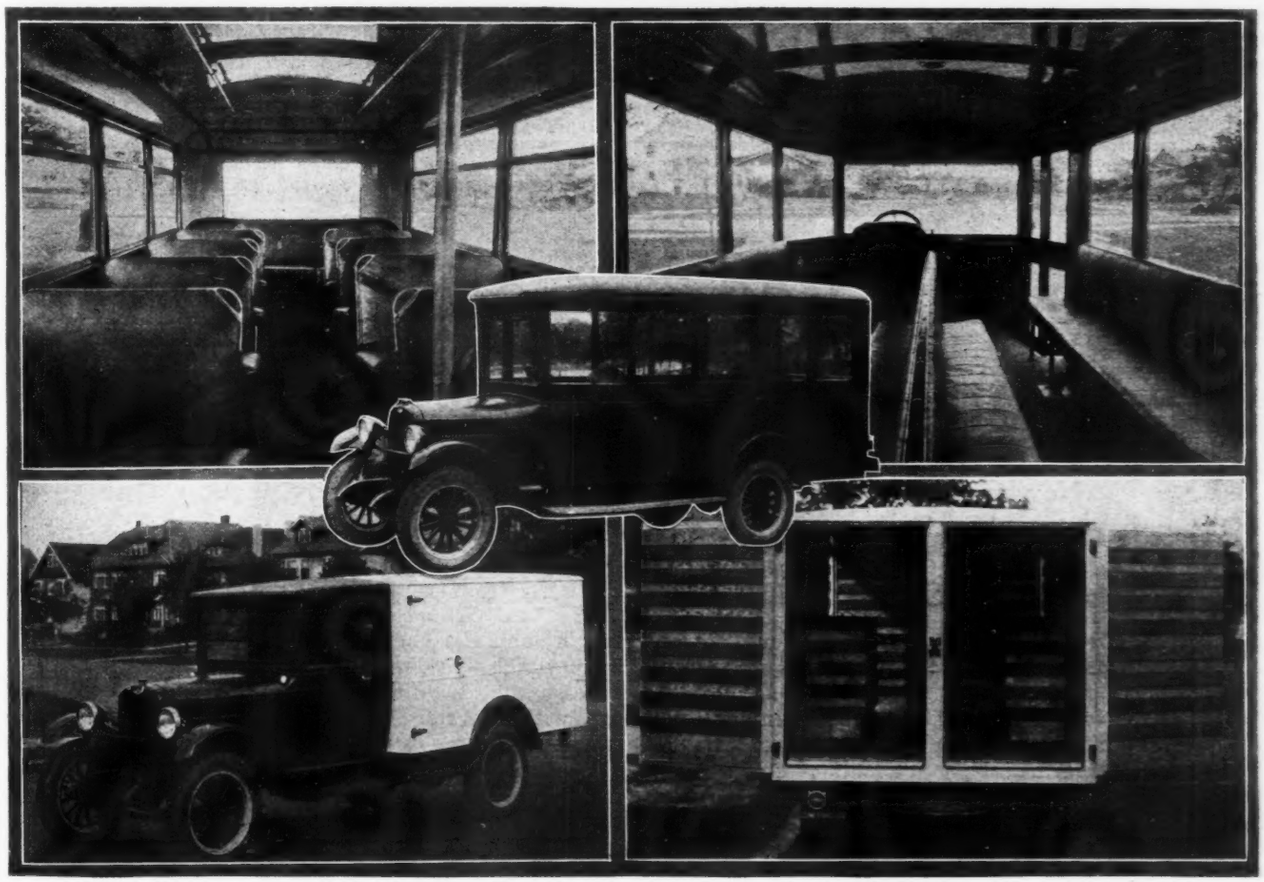
Expressed in Per Cent

The right-hand member of this proportionality is expressed in per cent and shown in Table II. For convenience in computing the loads on the chassis, halves of the values of the left-hand members of the proportionality are expressed in per cent and given in Table III with a tabulation of the actual loads on the chassis due to a passenger load of 5280 lb.

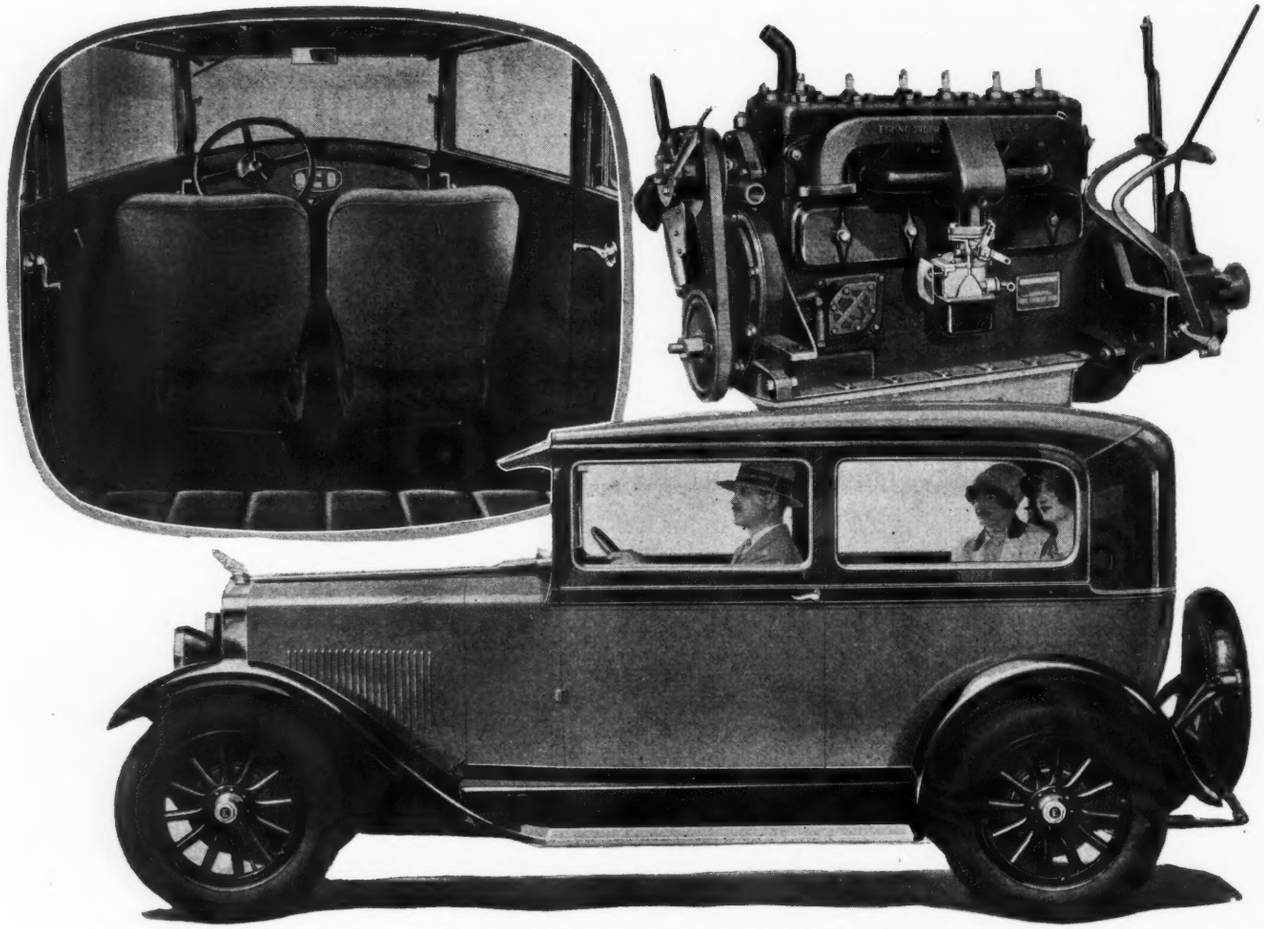
These loads were plotted graphically together with their shear and bending moment diagrams and also the deflections curves obtained in the test of the bus. It was noted that the bus is a good example of the ox cart variety. The shear and moment diagrams are interesting in connection with the chassis design but give little information concerning the body.

Lang Designs Four New Commercial Bodies

THE Lang Body Co., Cleveland, Ohio, has recently developed four new bus bodies—a 21-passenger street car type body to be mounted on the new General Motors T-40 Buick-motored chassis; a de luxe school bus body for the T-20 G.M.C. truck chassis; another de luxe bus body for the Chevrolet 1-ton chassis, and a Frigid-Ware body which is heat and cold-proof and designed for the transportation of perishable products of all kinds, also for mounting on the Chevrolet chassis. Views of the bodies are shown below.



Upper left—Interior of Lang 21-passenger body designed for new General Motors Buick-motored chassis. Upper right—Interior of Lang school bus body mounted on G.M.C. T-20 chassis. Center—Lang school bus body mounted on Chevrolet 1-ton chassis. Lower left—Exterior of Lang Frigid-Ware body on Chevrolet chassis. Lower right—This Lang Frigid-Ware body can be iced and is designed to be heat and cold-proof



Upper left—Both front seats on the new Erskine club sedan are of the folding type and are mounted on adjustable brackets. Upper right—Side view of the Erskine engine, showing the new Schebler carburetor. Note baffle plate used to prevent entry of dirt into carburetor. Bottom—"American edition" of the Erskine Six. This model, the two-door club sedan, lists at $795

"American Edition" of *Erskine* Six Announced *by* Studebaker

New model has larger engine and roomier bodies. Bendix three-shoe brakes adopted. Schebler 1-in. air-valve type carburetor fitted. Club sedan lists at $795.

STUDEBAKER CORP. has announced for 1928 an "American edition" of the Erskine Six with a two-door club sedan listing at $795, which is $100 less than the former lowest-priced model in the line. In spite of this decrease in price, the performance has been bettered, mainly as a result of an increase in the cylinder bore; the braking has been improved by the adoption of Bendix three-shoe brakes in front and rear, and body dimensions have been increased materially. .

Aside from the hood, which retains the former Erskine lines in modified form, the two-door body is entirely different in appearance from previous models. Belt lines are higher, cheat moldings along the bottom of the sides give an appearance of still lower height, and the corners are all well rounded. This body, which was designed by Dietrich, is built by Studebaker and is finished in sable and fawn body colors, with pin striping in red and gold, and maroon wheels.

With the increase in cylinder bore to 2¾ in. (increasing the displacement to 160.4 cu. in.), with the adoption of a Schebler 1-in. air-valve type carburetor, and with changes in the manifolding and the form of the combustion chamber, a material increase in acceleration and top speed has been effected.

That the increased power available due to these changes has not been translated into speed alone is evidenced by the fact that the same rear axle ratio of 4.78 to 1 is retained. The rear axle has been im-

proved in design, however, bearings being larger, and the tread wider. Frames have been widened 4 in. at the rear to permit of a roomier body.

To allow for the increased engine power, the radiator has been enlarged, and the water capacity increased 12 per cent. This change also effects the body lines, the larger radiator shell permitting a better blending of hood and body lines.

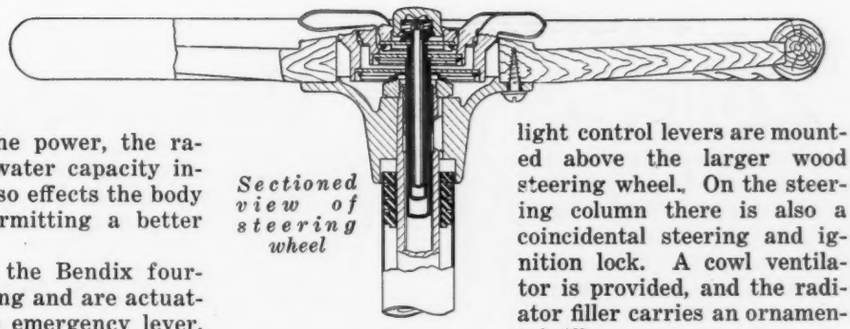
Eleven-inch drums are used for the Bendix four-wheel brakes, which take 1½ in. lining and are actuated both by the brake pedal and the emergency lever, there being no additional brake provided for the hand lever.

The wheel base remains 107 in., and the car turns in a circle of 36 feet diameter. For easier handling the steering gear ratio has been increased to 13 to 1. Riding quality has been bettered by softening the action of the springs.

Body Changes Most Important

It is in the bodies, however, that the most important changes have been made. The inside length has been increased 1¼ in., and the widths of the seats 3⅛ in. in the rear, and 2¾ in. in front. Adjustment of the front seats up to 2 in. is provided by three holes in the seat mounting bracket. Head room has been increased ½ in.

Upholstery is in velour, and a dome light and remote door controls are standard. Wider doors make access to the rear seat easier. An attractive new instrument panel is recessed in the instrument board, the latter being lacquered to match body colors. The panel in addition to the usual instruments, carries a hydrostatic gasoline gage. Throttle, spark and headlight control levers are mounted above the larger wood steering wheel. On the steering column there is also a coincidental steering and ignition lock. A cowl ventilator is provided, and the radiator filler carries an ornamental filler cap.

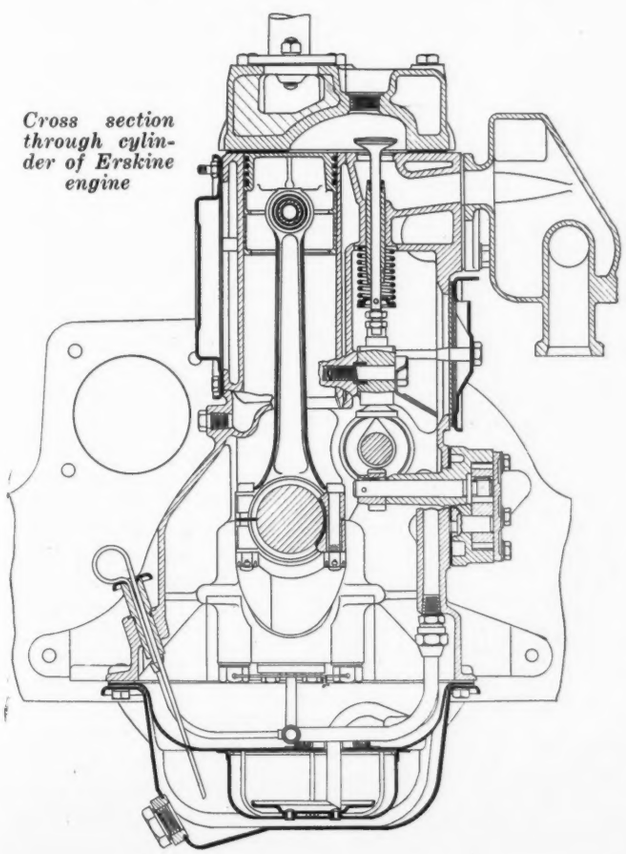


Sectioned view of steering wheel

Following are major specifications:

Bore and stroke	2¾ by 4½ in.
N.A.C.C. rating	18.1 hp.
Piston displacement	160.4 cu. in.
Lubrication	Press. to main, conn. rod and camshaft bearings.
Piston material	Cast iron
Valve arrangement	L
No. of main bearings	4
Carburetor	Schebler, 1 in.
Wheelbase	107 in.
Tire size	29 by 4.75
Rear axle ratio	4.778 to 1
Transmission	3-speed
Brakes	4-wheel Bendix
Price	$795

Other body models of the Erskine will also be available with the new engine.



Cross section through cylinder of Erskine engine

Aircraft Supercharging Problems Are Analyzed

AN analysis of the problem of supercharging aircraft engines has been made by the British Aeronautical Research Committee and is dealt with in the report of the committee for 1926-7. The following critical notes on this section of the report are from *The Engineer*.

The remarks made (in the report) are not entirely favorable. Doubts are expressed, for instance, regarding the gains to be expected from supercharging, and existing conclusions on the point will, it is remarked, soon demand revision. The general problem is how to secure the greatest power with a given weight under definite operating conditions. It is complicated by the fact that what matters is not simply the weight of the engine alone, but the weight of the whole plant, including the fuel necessary for a given range of action. Any method of supercharging, according to the committee, tends to increase fuel consumption, because decreased compression ratios have to be used to avoid detonation. In assessing the value of supercharged engines, it is necessary to remember that un-supercharged engines can now be constructed which may consume more than their own weight of fuel in a three hours' flight. Nothing therefore that will decrease the weight of the engine is of real practical importance if it increases unduly the weight of fuel which has to be carried. Exact information on the fuel consumption of supercharged engines is lacking, and the committee consequently is arranging for the construction of a single cylinder unit which will be capable of being supercharged to several atmospheres pressure, and which will enable important questions of detonation, fuel consumption and heat transfer to be accurately explored.

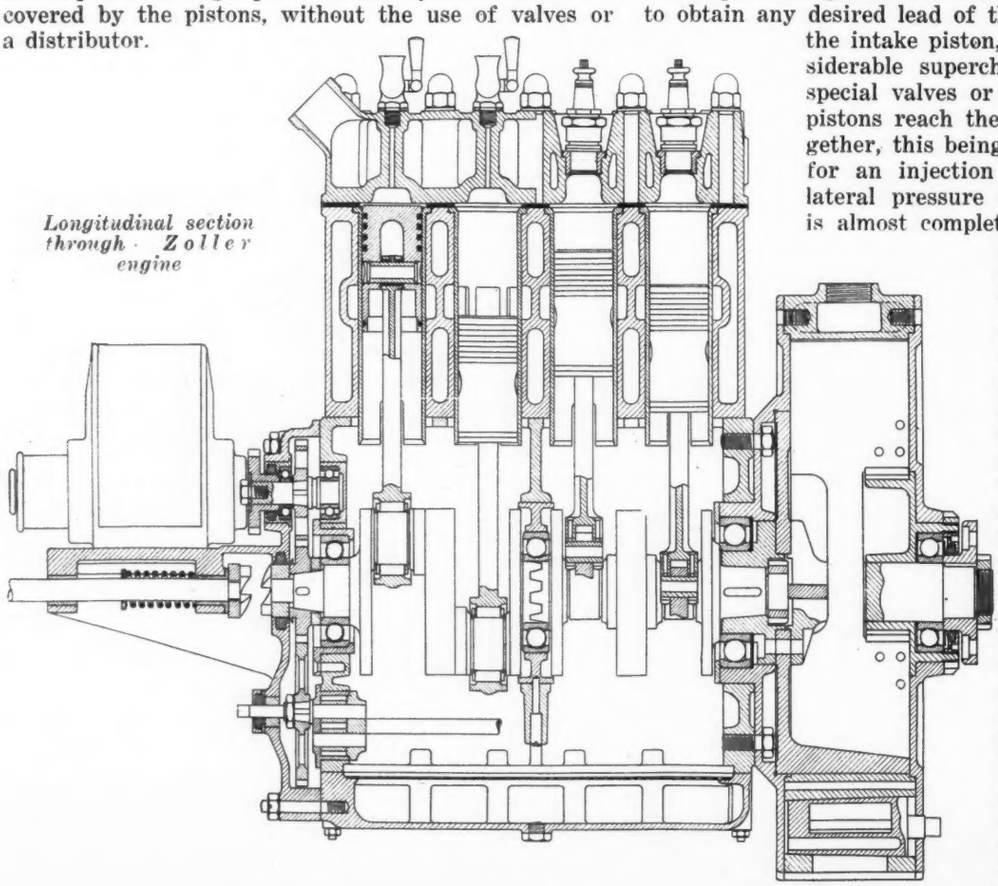
Zoller Engine Has Eight Cylinders, Four Combustion Chambers

Supercharged, two-stroke, double-piston powerplant of 45 cu. in. displacement designed for automobile, motorcycle and airplane use is of valveless type.

By W. F. Bradley

A SUPERCHARGED, two-stroke, double-piston engine has been perfected in Europe recently by Engineer Zoller, and has been produced for car service as a four-cylinder model of 45 cu. in. piston displacement and for use on a motorcycle. The same type of engine is also under construction for the German Government aviation department.

The small engine produced in France has eight cylinder bores, eight pistons and eight connecting rods, but only four combustion chambers. The cylinders are vertical and form pairs, in cross section. A four-throw crankshaft is used, this being assembled in two parts and carried on three ball bearings. The main connecting rod has roller bearings on the crankpin, while the companion rod is pinned to the main rod. The fresh gases are admitted and the exhaust gases are expelled through ports in the cylinder walls uncovered by the pistons, without the use of valves or a distributor.



Longitudinal section through Zoller engine

The rods being attached to different centers, the exhaust is given a lead over the intake, thus uncovering the exhaust ports while the inlet ports are closed and closing the exhaust ports while the inlet is open. Alternating movement of the current of gas is avoided, for the mixture enters through the port at the base of the intake cylinder, flows upwards into the common combustion chamber and is exhausted at the base of the opposite cylinder. Although the strokes are not alike, the two pistons are at the upper dead center together, and this makes it possible to construct the engine as a direct injection type.

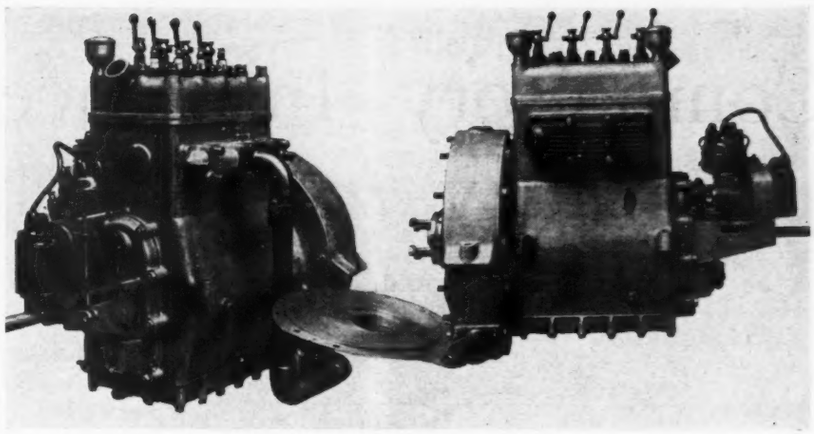
A model is now under construction in which pure air is sent under pressure into the cylinders and heavy oil injected into the head.

The advantages claimed for the Zoller type of double-piston engine are the following: It is possible to obtain any desired lead of the exhaust piston over the intake piston, thus obtaining a considerable supercharging angle, without special valves or distributors. The two pistons reach the upper dead center together, this being an essential condition for an injection type of engine. The lateral pressure of the exhaust piston is almost completely neutralized by the secondary rod operating the inlet piston. This reaction eliminates all lateral pressure on the exhaust piston during the power stroke, leaving only the friction of the piston rings. The admission piston operates on the secondary piston, the lower point of which does not turn around the center of the crankshaft. The rotational trajectory of this point is under the center of the admission cylinder, thus keeping the inclination of the rod within normal limits and reducing the lateral pressure on the admission piston.

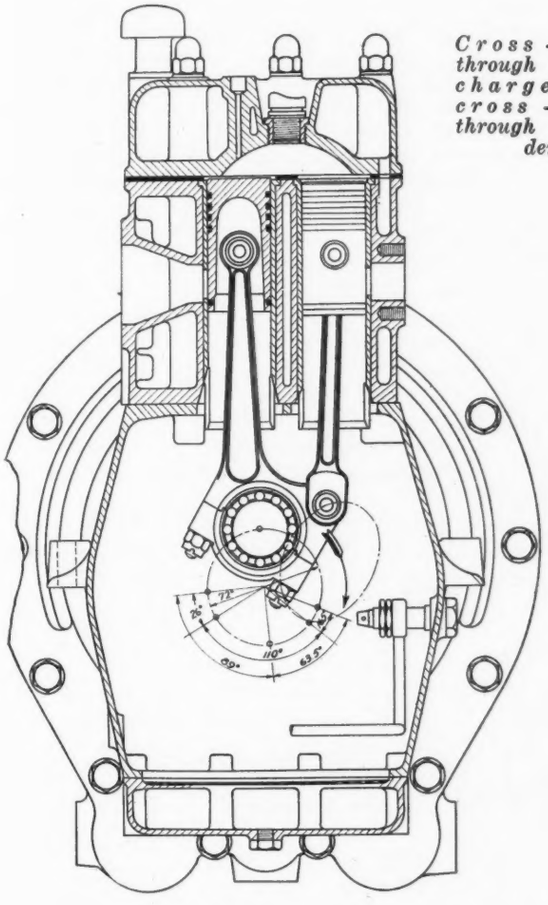
The four-cylinder engine, which has been built in the shops of the Chapuis & Dornier Co., of Paris, has the external appearance of a normal four-stroke engine. Cylinders and upper half of crankcase are one casting, the exhaust is on the right and the intake on the left, and the magneto is driven from the front. The only distinctive feature of the cooling is that the water is led first to the base of the exhaust cylinders, just below the exhaust manifold.

One of the features of the Zoller engine is the rotary type compressor built in as a part of the flywheel. This compressor has either four or six duralumin vanes, these being in pairs, and guided in the rotor, which is driven eccentrically. A very high degree of eccentricity is obtainable, and the compressor has a high output and compression for reduced overall area.

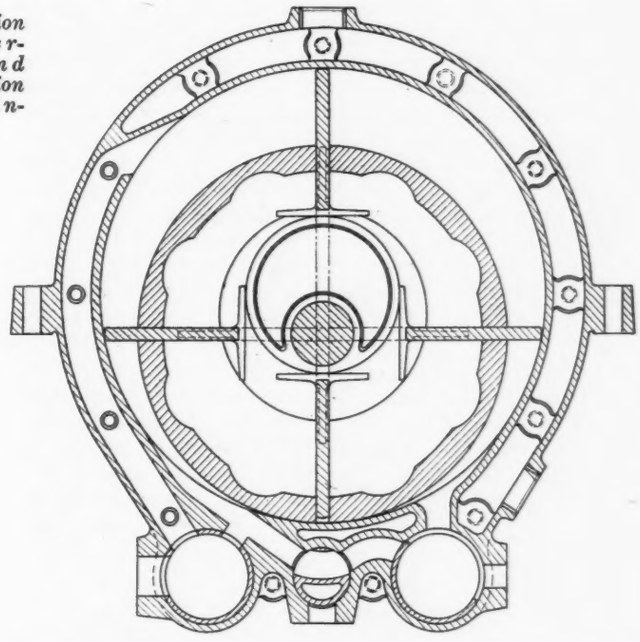
The movement of the vanes not being subjected to centrifugal force, but positively controlled, it is possible to assure a mathematically determined compression at low speeds. The inventor claims that with this type of compressor he can produce a two-cycle engine giving sufficient flexibility to make the use of a change speed gear unnecessary. The small car engine just produced has mechanical control over the quantity of air admitted into and discharged from the compressor.



Zoller eight-cylinder, two-stroke supercharged engine, inlet and exhaust sides



Cross - section through supercharger and cross - section through cylinders



A NEW fifth edition of "The Testing of Rubber Goods," Bureau of Standards Circular No. 38, has been issued by the Bureau. The circular describes the methods in use at the Bureau in the testing of rubber goods. The physical tests commonly employed are described in detail and the machines used for this purpose, many of which were designed at the Bureau, are illustrated and described. Data are given showing the effect of different conditions on the tensile properties of the rubber. Special attention is given to the effect of temperature on the physical tests. The circular also contains a brief outline of the methods of collecting crude rubber and the processes used in the manufacture of various rubber articles.

A NEW edition (first revision) of Simplified Practice Recommendation No. 45 (Grinding Wheels) has been issued by the Bureau of Standards. Copies can be had from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at 10 cents.

Compulsory Insurance *Facts* Still Hazy *in* Massachusetts

Merits of year-old legislation sung chiefly by its proponents with those unfriendly to the law intimating that the machinery isn't working any too smoothly

By John C. Gourlie

AFTER a year of operation of the Massachusetts compulsory liability insurance law the merits of the legislation still appear to be mainly a subject for the vociferation of its proponents, rather than of impartial demonstration. The facts are elusive, and are likely to remain so for some time. On the other hand, among those unfriendly to the law, whisperings are heard that the machinery of compulsory coverage is not working with the well-oiled efficiency that may have been hoped for, if not expected.

The question is of more than local importance. Although efforts to pass similar legislation in other States during 1927 were unsuccessful, agitation is unabated and serious thought is to be given to new laws, at least in New York and New Jersey, and probably others of the nine States in which legislative sessions are to be held this winter. Only the recurrence of an off-year in legislative activity forestalls wider consideration.

Support for the Massachusetts law, naturally enough, is heard largely from official sources. As the majority of motorists do not feel the need for liability insurance, they probably tend to regard the law as adding unnecessarily to the cost of operation. The pedestrian public, save for the individuals who have benefited generously, is likely to remain apathetic. Insurance companies frankly do not know where they stand.

The burden of the defense made by the State executives who fostered the law and are engaged in its administration may be summarized briefly; compulsory insurance is achieving its primary purpose of protecting the public from the negligence or incompetence of financially irresponsible drivers, so far as payment of monies can compensate for injury or loss of life. Defects in the law have developed, but they are minor ones, readily corrected by a little legislative tinkering.

One of the points made by critics of the measure, is that some motorists are attempting to get repair bills paid under the false guise of personal injury. Two cars collide. The owner of one of them, who shall here go incognito as Mr. A, is himself uninjured, but his car has a crumpled fender or a leaky radiator. He knows that his co-collisionist, unknown to fame as Mr. B, carries liability insurance. So Mr. A decides that he is suffering from a severe contusion of the scalp, from shock, from loss of business and many other grievous conditions.

Of course the insurance company is aware of the duplicity. But what is it to do? A successful defense could probably be established in court, but the cost would be at least $100, while Mr. A could be induced to consider himself a well man again by the payment of, say, $25. Whichever way out is taken means a loss to the underwriter.

The insurance company, it may be, would rather pay fraudulent claims for minor sums than go to court. Especially as payment of claims adds to established losses, which are the basis for rate making. Legal expenses are overhead and do not go into "experience."

In any event, costs may conceivably accumulate so that insurance companies will be unable to do business at the present rates. Then the rates will have to be raised, amid a storm of opposition, or the government may go

After a year of operation, there is still much to be learned about the Massachusetts compulsory liability insurance law. Further experience and study are necessary to determine its true effect

into the insurance business and cover up its losses. Doubtless the latter expedient would be rejected as a breach of faith with the electorate.

Nuisance claims, of course, are nothing new for insurance companies, but they are vastly increased by universal insurance, as all Massachusetts motorists are now known to be covered. The situation is worse when the case of the person who deliberately seeks minor personal injuries is considered. A slight bump in slowly moving traffic may be the basis for a heavy claim.

Just how disguised property damage claims, and other fraudulent practices, are to be eliminated does not appear from the material at hand. There has been a suggestion that the State, after compulsory liability insurance has been working well for a time, may favor compulsory property damage insurance. But property damage is a notoriously costly form of coverage, and even more subject to nuisance claims and the moral hazard than personal liability insurance.

Court congestion seriously impairs the value of personal liability insurance, as the victim of an accident, if poor, cannot afford to wait for a decision and may be obliged to accept a nominal settlement from the insurance company. Along these lines, a veteran Massachusetts automobile man writes to *Automotive Industries* as follows.

"One of the objects of the law was to protect the families of those killed or injured by automobiles. But the motorists would like to have the insurance companies bare their books and show how many settlements they have made, say, of more than $500 in case the father or brother or other breadwinner of a family has been taken away. At a recent gathering in Boston complaints were received of persons having been injured and being offered as little as $10 by insurance companies; others received a few hundreds.

"Many in Massachusetts, after reading the eulogies that accompanied the introduction of the legislation, believed that in the event of accident or death all they had to do was go to the State House and collect up to $5,000. When they found that they had to make their settlement with the insurance companies as in the past, they were not pleased. When these cases multiply, and the long-drawn court cases fail to produce satisfactory results, there will be widespread dissatisfaction."

The Safety Question

In course of the discussion which still rages in and out of Massachusetts, concerning the merits of compulsory insurance, much is heard on the safety question. Earlier in the year automobile fatalities were running ahead of 1926; but in recent months the showing has been bettered and it now seems probable that 1927 figures will be lower than those for last year. However, the change will hardly be great enough, one way or the other, to serve as much of a basis for argument.

The Massachusetts executives point out that the legislation was not designed as a safety measure and that its success does not depend upon a marked reduction in accidents. But they add that it should help the safety movement in two ways: first, because unfit drivers will be refused insurance and therefore will be unable to operate cars; second, because under the law more extensive and detailed reports on accidents are being made, adding to knowledge of causes and thereby pointing the way to measures of correction.

As to the effects of the Massachusetts law upon the automobile trade, dealers in many instances feel that the failure of registration in the State to show the normal increase this year can be traced to the added cost of operation under the law. Used car sales are particularly influenced and the dealers fear the result of an increase in rates, if any were found necessary after further experiment with the law.

The official position on this matter is that the law was not intended to benefit the dealers nor the motorists, but the many who do not own cars.

So the debate waxes and wanes. The whole question may yet become a major political issue in Massachusetts and legislators elsewhere may prefer to await the results of further experience with the law before supporting similar proposals for their own States.

Famous Automotive Brothers

(Continued from page 972)

years ago, the Packards took an active interest in the development of the Packard Motor Car Co. As a tribute to J. W. Packard the directors of the Packard Motor Car Co. last spring caused to be erected a beautiful bronze tablet in the lobby of the Packard executive officers. W. D. Packard died Nov. 11, 1923.

There are five brothers among the officers of the Wood Hydraulic Hoist Co. of Detroit, which manufactures hydraulic truck hoists and steel dump bodies. The president and originator of the company is the well-known Garfield A. (Gar) wood of speedboat fame. The brothers associated with him in the business are: Logan, executive vice-president; Louis, chief engineer; Phil, manager of the Canadian plant, and Clinton, manager of the production and order departments. Incidentally, there are four more brothers in this family but they are engaged in other pursuits.

In a few years we may expect to find four brothers holding important positions in the Firestone Tire & Rubber Co. These are the sons of Harvey S. Firestone, president. Two of the brothers, Harvey, Jr., and Russell, are already associated with their father, the former as vice-president of the Firestone Plantations Co. and a director of the Firestone Tire & Rubber Co., and the latter as vice-president of the Firestone Tire & Rubber Co. of California. Leonard and Raymond are still in school but will probably take their places in the organization upon completing their studies.

The Pope family has been represented in the industry by two sets of brothers. Colonel George Pope was treasurer of the old Pope Mfg. Co. and his brother, Edward W., was secretary. They were cousins of Colonel A. A. Pope, who founded the company and was at one time the leading bicycle manufacturer in the country. George Pope was for many years chairman of the show committee of the Association of Licensed Automobile Manufacturers in the Automobile Board of Trade, and later in the National Automobile Chamber of Commerce. He has been dead for some years. Edward is still living.

The other Pope brothers are Albert L. and Harold L., sons of Colonel A. A. Pope. The former once served as president of the Pope Mfg. Co., but has long since been out of the automobile business and is engaged in another manufacturing line. Harold was at one time general manager of the Toledo Motors Co. Later he was assistant general manager of the Wright Aeronautical Corp., and is now chief engineer of a refrigerator company in Michigan.

Maneuverability *and* Turning Radii *of* Motor Buses

How the turning radius may be calculated. Affected by tread, wheelbase and the maximum angle through which the inner of the two steering wheels can be deflected.

By P. M. Heldt

WITH the growing congestion of our city streets, the maneuverability of vehicles designed for use in them becomes of increased importance. Maneuverability is to a certain extent a matter of turning radius, and from this point of view the shorter the turning radius the better.

The turning radius of a car depends upon three factors, namely, the wheelbase, the tread, and the maximum angle through which the inner one of the two steering wheels can be deflected from the straight ahead position (or what is generally known as the angle of lock). In the past there has been some uncertainty as to just how the minimum turning radius should be measured. There are evidently three possible ways, namely, from the center of the turning circle or the turning axis (1) to the center of the tread of the outside front wheel; (2) to the outside of the outside front wheel rim or tire, and (3) to the outside of the hub cap of the outside front wheel. This matter was settled last summer when the Motor Coach Division of the S. A. E. Standards Committee decided that "the turning radius of an automotive vehicle is the radius of the arc described by the center of the track made by the outside front wheel of the vehicle when making its shortest turn."

The geometry of the steering diagram is shown in Fig. 1 herewith. The car when making the shortest possible turn, turns around a point *0* determined by the intersection of the axes of all four wheels when the front wheels are swung around through the maximum angle. The inner one of the front wheels always swings through the largest angle and the limiting angle is usually determined by a stop with which the knuckle of the inside wheel comes in contact just before the wheel itself comes in contact with the frame or steering drag link.

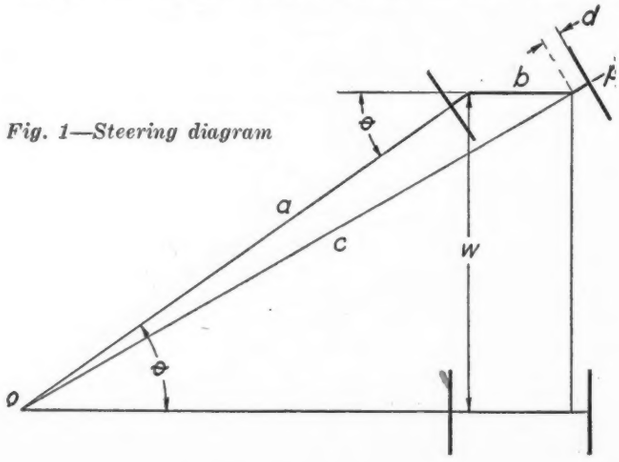


Fig. 1—Steering diagram

Let w be the wheelbase; b, the distance between knuckle pin axes, and d, the distance from the point where the knuckle pin axis intersects the ground to the center of tire contact on the ground. The steering diagram then comprises an oblique-angled triangle whose sides are marked a, b, and c in Fig. 1. It is evident from the diagram that $w = a \sin \theta$, and $a = \omega/\sin \theta$, θ being the angle of lock of the inner wheel or the maximum angle through which this wheel can be deflected from the straight-ahead position. The angle included between the sides a and b is equal to $180° - \theta$. Hence the sides a and b and the angle between them are known, and the problem is to find the length of side c, the side opposite the known angle.

By one of the rules for the solution of problems of the oblique triangle,

$$c = \sqrt{a^2 + b^2 - 2\,a\,b\,\cos\,(180° - \theta)}$$

But $\cos\,(180° - \theta) = -\cos,\theta$, and substituting this in the above equation we get,

$$c = \sqrt{a^2 + b^2 + 2\,a\,b\,\cos\,\theta}$$

If now we substitute the value of a in terms of the wheelbase and angle of lock we have an expression for the length of c entirely in known terms—

$$c = \sqrt{\left(\frac{w}{\cos\,\theta}\right)^2 + b^2 + \frac{2\,\omega\,b}{taw\,\theta}}$$

The least turning radius is equal to $c + d$ and hence is

$$R = \sqrt{\left(\frac{w}{sin\,\theta}\right)^2 + b^2 + \frac{2\,\omega\,b}{tan\,\theta}} + d\ in.$$

Such an expression for the least turning radius is hardly needed, however, for its value can be readily determined graphically. Referring to Fig. 1, a plan view diagram of the chassis is laid out to scale, comprising the line b representing the distance between knuckle pivot axes, two straight lines at right angles thereto through the knuckle pivot axes and equal in length to the wheelbase; at the ends of the latter and at right angles thereto a line representing the rear axle, and at the ends of the latter two lines representing the rear

wheels. From one of the knuckle axes a line is then drawn making an angle with the front axle equal to the maximum deflection which it is desired to allow for the inner wheel, until it intersects the extended rear axle line. The point of intersection marks the turning axis of the car. From this same point *O* another straight line *c* is drawn passing through the other knuckle pin axis, and finally the two front wheels are drawn in at right angles to lines *a* and *c* and at the proper distance *d* from the knuckle pin axes. A measurement of the distance *O-P* then gives the least turning radius.

It is readily apparent from Fig. 1 that if the diagram were expanded "photographically"—that is, if the wheelbase and tread were increased proportionally and the angle of lock remained the same—the least turning radius would increase in direct proportion to the wheelbase (and to the tread). However, there is no proportionality between wheelbase and tread.

A study of the dimensions of 60 buses on the American market shows that when values are averaged the tread varies with the wheelbase as indicated by the curve in Fig. 2. The straight line in the same figure is one line of direct proportionality between ordinates and abscissas, this line passing through the zero points on both scales. It will be seen that the smaller buses have a tread very close to standard and that at first the tread increases only very slowly with the wheelbase. In fact, most of the buses of 175-in. wheelbase and less have a standard tread, the somewhat higher average tread of these being due to a few buses with materially larger tread. These buses are used more than the larger ones in the less developed sections of the country, where, on account of the rutted roads at certain seasons of the year, adherence to the standard tread is of considerable importance. It will be seen that for buses of 200 in. wheelbase and over the tread increases very nearly in proportion to the wheelbase.

Turning radii in feet, averaged, vary with the wheelbase as shown by the curve of Fig. 3. It will be seen that these too increase only slowly with the wheelbase at first, but are substantially proportional to it near the upper end of the range in sizes. The wide scattering of the points denoting turning radii of individual buses will be noted. The points for some of the longest as well as a few of the shortest turning radii fall outside the chart and therefore are not shown, but they were considered in drawing the curve of averages.

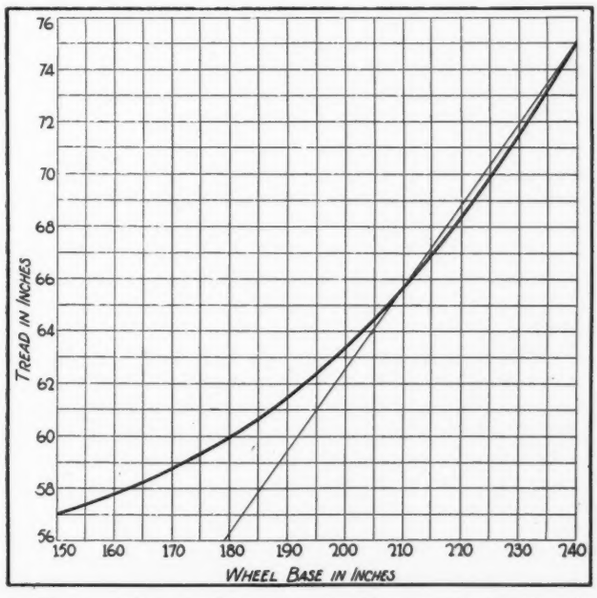


Fig. 2—Relation between wheelbase and treads of American motor buses

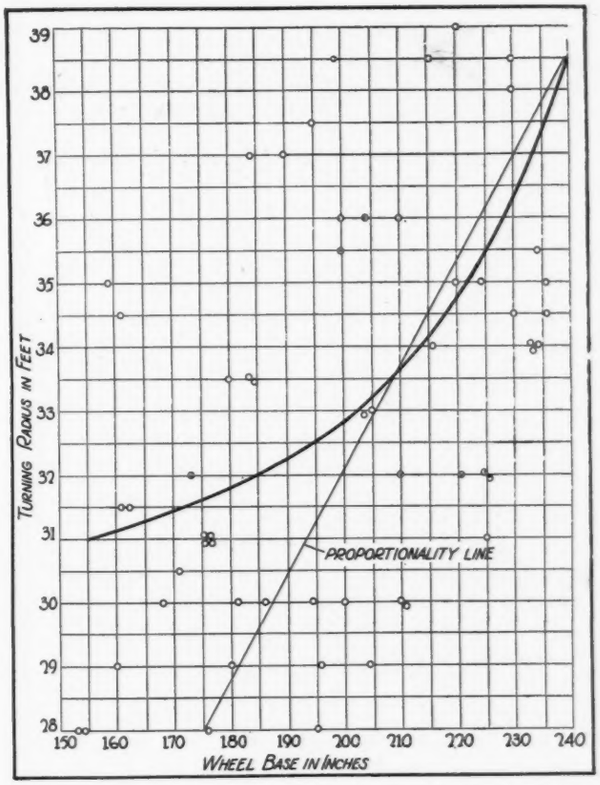


Fig. 3—Relation between wheelbase and least turning radii of motor buses

Short turning radii are an advantage from the standpoint of ease of maneuvering. However, in order to secure these short radii it is necessary to narrow the frames in front, and this is somewhat objectionable in that it tends to weaken the frame (assuming that the narrowing is accomplished by off-setting the frame side members). Wheels of smaller diameter also are a help in securing a shorter turning radius. It is possible that safety considerations also enter into the determination of the minimum turning radius. The greater the angle through which the driver can swing his front wheels the greater the danger of skidding when turning corners at speed. On the other hand, the greater the steering angle the better the chance of avoiding obstacles by skilled handling of the wheel.

The writer does not wish to draw any conclusion as to the best turning radius for a bus of any particular length of wheelbase from the data presented, but believes that the data itself will be a valuable guide to bus designers.

IN a paper presented at the recent annual meeting of the International Acetylene Association at Chicago, W. H. Dreis of the Dreis & Krump Mfg. Co., Chicago, outlined methods employed by his organization in producing machine tools with bases and other parts fabricated by cutting and welding standard plates and shapes. "This method of construction," said Mr. Dreis, "not only makes possible production of equipment at lower prices, but also gives the user apparatus that is practically free from accidents, as gray iron is almost entirely eliminated in the construction of machine tools.

What's New? • • • *Machine*

Bliss High-Speed Punch Press

THE E. W. Bliss Co., of Brooklyn, N. Y., has recently designed and built a new type high-speed press operating at 300 strokes per minute and designed particularly for punch press work.

A high-speed punch press operates principally on large quantity production runs, and on such work die life is a factor of great importance. If the punch springs on an arc or sways with respect to the die, in a press with too light a gap-frame or due to unbalanced loading in a four-rod machine, there will be excessive wear on the cutting edge, especially as the dies for this class of work are likely to have small clearance. Straight stretch in rods or side frames, or deflection of shallow slides or beds will cause the punch to snap through the die as the blank fractures, causing excessive wear.

The press shown is built with a massive frame, keyed in alignment and tied together with oversize tie-rods. These rods are shrunk-in on the housings under an initial tension in excess of the rated load of the machines. The eccentric type shaft is supported right up to the crankpin, and substantial subpresses with large hardened and ground pins and bushings maintain the alignment.

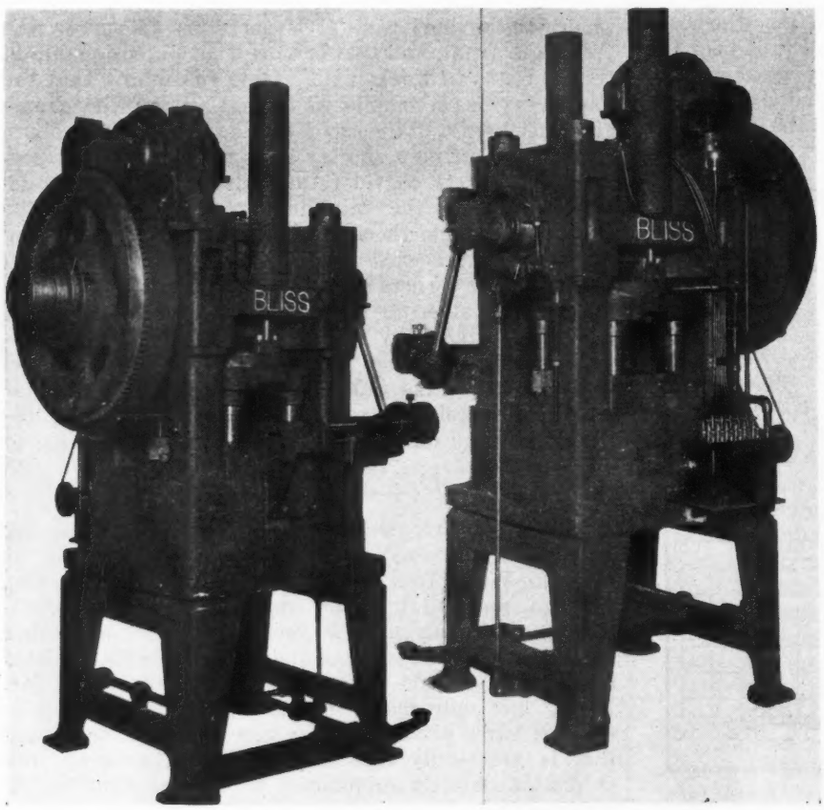
These presses are made with short strokes, to keep down the working velocity of the punches. Also, in view of the high speed, all moving parts are kept compact and their weight is balanced by long compound springs. The face of the slide is quite close to the centerline of the crankshaft. As in the case of the "Stiles" type presses, these machines are only for one class of work (largely blanking), and large adjustment is not required. The adjusting wedge provided furnishes ample adjustment and is controlled by a screw with a disk graduated to facilitate fine settings.

The clutch fitted is the Bliss high-speed rolling key type. The hardened alloy steel rolling key presents a long and completely backed-up surface to engagement with the wheel bushing. For this service, special long hook clutches and latches are provided, so that, after the key has rolled out of engagement, an extra long period is allowed for the brake to bring the shaft to rest, before the positive stop hook reaches the latch recoil. Brakes used are of the intermittent type, which are free while the press is running.

Most of the bearing surfaces are steel on bronze, trapped to return the oil to the slide and thence through a strainer to the tank. A positive force feed pump with separate lines to each bearing distributes the oil.

An opening of any desired size can be provided in the bed to drop work straight through. The working parts are on top, leaving the floor space about the machine unencumbered.

Mechanical feeds of several types can be furnished on these machines, including single and double roll feeds, driven continuously or intermittently; magazine feeds, etc. The press illustrated is equipped with a continuously operating single roll feed driven through helical gears and equipped with a modified flying stop gage. The rolls are hollow and hardened on the surface, and roller guides are provided. Adjustment of the roll relief is independent of the feed stroke adjustment, permitting very close settings. The friction drive with hardened rings and rollers, as used on the standard Bliss roll feeds, is used, unless the single or multiple pawl ratchet type is preferred. The feed is arranged to operate either front and back or right and left across the bed, as required, leaving the dies readily accessible. The sub-press is easily removed if necessary but is not removed for changing dies.



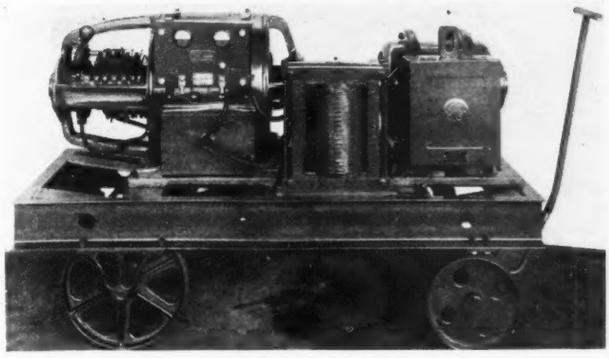
Front and rear views of Bliss high-speed punch press

Single-Operator Welder

A NEW single-operator welder rated at 300 amp., with a temperature rise not exceeding 50 deg. C. in one hour, is announced by the General Electric Co. as the latest addition to its standard line of welding equipment. This machine includes a four-bearing (ball-type) motor-generator set with flexible coupling. With this arrangement a rapid and simple interchange of motors may be made by the user, and inspection and maintenance are simplified.

The motor is rated at 15 hp. with

Tools, Accessories and Parts



New G. E. single-operator welder

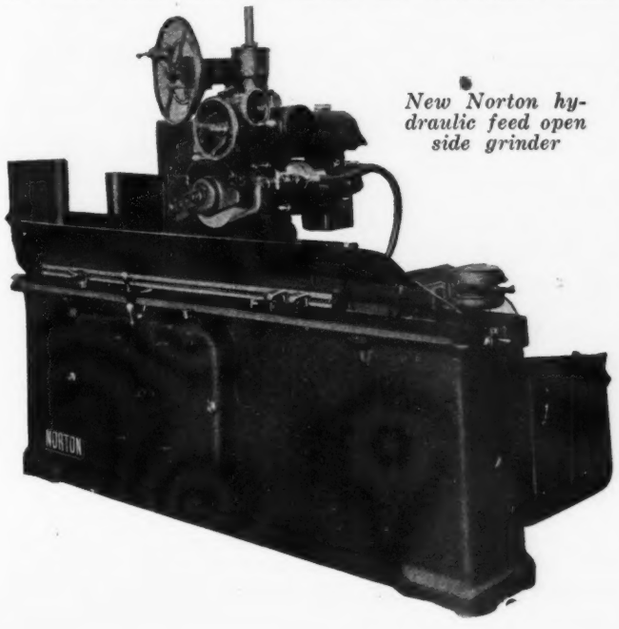
a rise in temperature of not over 40 deg. C. in continuous operation. This conforms to the recent ruling of the National Electric Manufacturers' Association. The generator is so designed that no field control is required and the generator panel carries an ammeter and a voltmeter but not the customary field rheostat. The meters used have a metal front, except for the glass over the scales, thus minimizing the danger of breakage.

Starters for 60 and 50-cycle motors are of the inclosed magnetic type, while those for the 25-cycle motors are inclosed resister starters. The direct-current motors use a simple resistance starter with a line switch. Starting current is maintained in each case well within N.E.L.A. requirements.

The generator is designed to permit belt, motor or engine drive, and will be designed for either stationary or portable use. It can be used as both a manufacturing and a repair tool.

Open Side Surface Grinder

A NEW model open side surface grinding machine with hydraulic table traverse and two table lengths has been announced by Norton Co., Worcester, Mass.



New Norton hydraulic feed open side grinder

The machine is built on a longer base than the former model and is designed to take two table lengths—one providing for work up to 36 in. long and the other for work up to 48 in. Finished pads on the table top are machined with T-slots for mounting magnetic chucks.

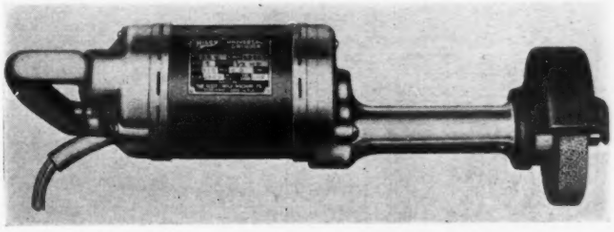
The hydraulic feed mechanism is inclosed in the base but is readily accessible through doors. All movements are controlled by two levers shown between the doors. The upper lever is used for reversing the table motion while the lower one controls the speed of table traverse and can also be used for stopping traverse.

Table speeds can be varied from 30 to 90 ft. p.m. and smooth reversal of direction at high speeds is accomplished by air cushions connected with the hydraulic mechanism. The new machine includes among its features flood lubrication of the grinding wheel spindle; spindle bearings adjustable while spindle is running; cross feed controlled by two hand wheels—one for regular operation and the other for slow motion; vertical wheel feed graduated to 0.00025 in.

A 15 hp. motor is bolted to the base to furnish power for both spindle and feed mechanism. Standard wheel size is 10 by 3 by 3 in. Weights of machines are 7300 and 7400 lb. for the two sizes and projected floor space is 12 and 13 ft. long by 64 in. wide.

Portable Grinder and Buffer

THE Hisey-Wolf Machine Co., Cincinnati, Ohio, has recently developed a ½ hp. portable grinder and buffer fitted with a ball bearing motor and roller bearing grinding spindle. The motor is of the universal type



New Hisey-Wolf ½ hp. portable grinder

to operate on 110 or 220 volts and is equipped with a Hisey two-pole switch.

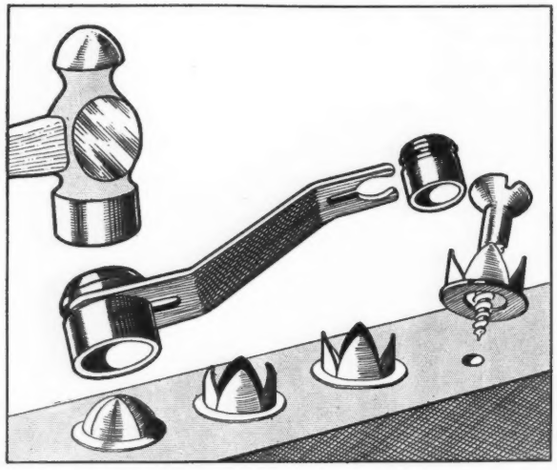
The wheel guard is of cast steel and is adjustable for any angle most convenient for the operator. The end cover is removable for replacing wheels. No-load speed is 3800 r.p.m.; wheel size is 5 by ¾-in., with ⅝-in. hole. Net weight without guard is 20 lb. Standard equipment includes 10 ft. of rubber-covered cable with attaching plug.

"Crowner" Screw Head Shields

FOR hiding unsightly screw, nail, bolt and rivet heads on work that should preferably have an attractive appearance, the Crowner Corp., Woolworth Bldg., New York City, has placed on the market the device herewith illustrated. It is made of sheet of any desired material. The screw, bolt, nail or rivet is passed through it and screwed or driven home, and the four flaps of the crown

are then closed up by means of a die of suitable form, and a hammer.

Among the advantages claimed for "crowners" are that they act not only as a head but also as a washer, that they obviate the need for polishing or nickeling

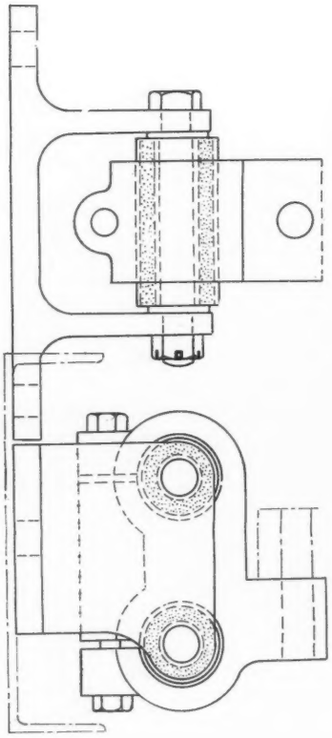


Crowners and the way they are applied

the screw head, that they cover up damaged screw heads, that they seal the screw, etc., against easy removal, and that they give the appearance of added strength. These crowners are made in all sizes from No. 2 to No. 22.

Rubber Engine Mountings

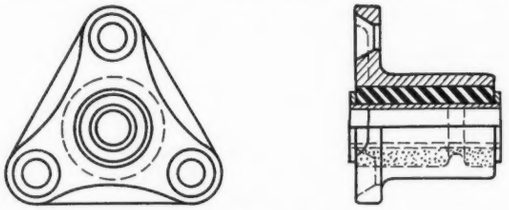
THE Powell Rubber Co., Utica, N. Y., has recently developed rubber mounting fixtures for mounting engines. The front engine mounting, designed for



Powell rubber-bushing-type engine front mounting

three-point suspension, has vertical rubber bushings on each side, while the rear mountings have two horizontal rubber bushings to eliminate rocking between the joints.

All rubber is carried under tension in these mountings, it being believed that rubber has a longer useful life under such a condition than when it is not stretched.



Powell rubber-bushing-type engine rear mounting

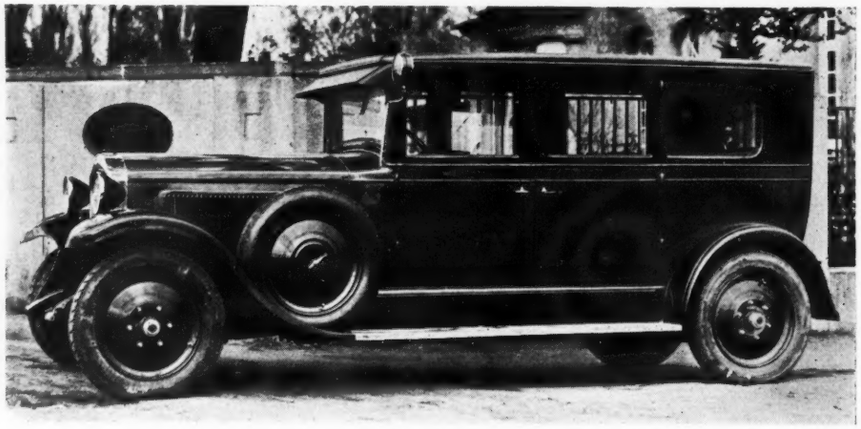
Opel of Germany Has Two New Sixes

By Edwin P. A. Heinze

GERMAN works just now are very busy developing new models, and next year, it is rumored, many of them will be put into production. Meanwhile Opel, who claims to be Germany's largest manufacturer of automobiles, has pushed forward the production of two new sixes that are arousing considerable interest among German buyers.

The chassis of the two cars differ only in respect to engine displacement, one of the engines having a bore of 3.15 and the other of 3.5 in., while the strokes of both are 4.09 in. The smaller engine has a piston displacement of 192 cu. in., the larger of 238 cu. in. The crankcase, as well as the flywheel housing and gearcase, which are bolted to it, are cast of aluminum, and the crankshaft runs in seven babbited bearings. Pressure lubrication is used. Camshaft and generator drive is by a triangular toothed chain. Bosch battery ignition is furnished.

The rear axle is of the built-up type, with axle shafts riveted to a central rear casing. This casing has an aluminum gear carrier at the forward side and a pressed steel inspection cover at the rear. Braking equipment consists of four-wheel mechanical service brakes and an emergency brake on the transmission. The driver sits on the left. The car has a tread of 56 in. and a wheelbase of 138 in.



Opel six-cylinder limousine

The chassis of the smaller car sells in Berlin at $1,345, and the prices of the various models with open and closed bodies range from $1,630 to $2,325.

Just Among Ourselves

Hoover's Statement Increases Optimism

LAST week we wrote a pretty optimistic article about the outlook for 1928. All the information and new contacts which have come to us since that time have been such as to make us feel even more firmly that 1928 is going to be a good bit better for everybody in the automotive business than was 1927. And now comes unusually important confirmation for those who are looking with confidence to the coming 12 months in the form of Herbert Hoover's summarizing sentence in his outlook statement just issued. He says: *"Taken in a broad sense we enter the New Year with the forces of stability dominant in the business world."*

* * *

More Automobile Per Dollar in 1928

IT has been our privilege to get a pretty good line on what is going to be in most of the new models that will be announced at the New York Show next week. (There will be an unusual amount of entirely new cars, by the way, and the shows bid fair to hold more interest this year than for some while back.) The one big impression which we get from looking over the new products is that Mr. Public is going to get infinitely more for his automobile dollar in 1928 than he ever thought of getting before. Prices on the whole seem to be about stationary. A few changes may occur here and there, but there is every evidence of virtual stability. At the same time, very definite and very real improvements have been made in practically every line. Better mechanical performance, more pleasing appearance and scores of added comfort-producing units designed to make motoring more pleasant and attractive stand out all over the industry's 1928 creations. Certainly an overwhelming majority of automotive retailers will have thoroughly salable products to work with next year and, by going out and asking 'em to buy in vigorous fashion, should be able to increase profits as well as volume to a material extent.

* * *

Progress as Measured by Cars and Telephones

THERE were 202 telephone conversations per capita in the United States in 1926, the National Industrial Board tells us. In 1900 there were 34 conversations per capita. Certainly emphasizes the rapid growth of telephone use in this country. For a long while, there were more telephones in the country than there were automobiles. Several years ago, however, the motor vehicle total went past the telephone total and has been climbing ever since. As compared with the telephone figure quoted, it is interesting to note that in 1900 there was one automobile for every 15,200 persons in the country, while in 1926 there was one for every 5.4 persons. These two sister means of communication have and will continue to facilitate each other's progress.

* * *

Small-Lot Buying Carried to Extremes

SMALL-LOT buying undoubtedly has been on the increase in automotive circles in recent years. The close study given to increasing stock turnover all through the manufacturing, wholesaling and retailing branches of the business have lead to extremes in small-lot purchasing which, in certain instances, undoubtedly are just as wasteful and just as uneconomic as were the overburdened inventory shelves which characterized conditions five or 10 years ago. Within the next five years perhaps the golden mean will be reached. This particular merchandising condition is not confined to the automotive industry by any means. Talking the other day with a group of business paper editors of publications serving a variety of industries, we found practically every one of them studying and discussing the same small-lot buying problems. Competition among manufacturers probably is as much responsible for small-lot buying as anything else. In efforts to get more business and to make their products more attractive for wholesalers and retailers to handle, the manufacturer has tended to bear more and more of the inventory burden on completed goods. In turn, he is trying to turn over his factory raw materials and parts inventory as fast as possible and his supply sources have to face small-lot buying as well—almost a circle in some ways. The pendulum still is swinging, however, and sometime may be expected to come to rest in a position relatively satisfactory to all concerned.

* * *

Traffic Accidents and Car Sales

ANYBODY who doesn't think traffic accidents have any real effect on automobile sales is going to get more and more disillusioned as time goes on. One step in that process will be accelerated by the further important jump in liability insurance rates which is going into effect in 1928. We know of lots of people who own one car and are stopped from owning two only by the high cost of garaging and insurance—and probably there are plenty of people who drive no car at all for the same r e a s o n s. Traffic and safety matters are vital factors in automotive development today.—N.G.S.

AUTOMOTIVE NEWS SECTION INDUSTRIES
Philadelphia, Pennsylvania
December 31, 1927

New Model Preparations Liven Factory Operations

PHILADELPHIA, Dec. 31—A large proportion of the motor car factories are now in production on new models to be announced in connection with the New York automobile show. The number of completely new cars to be exhibited exceeds all recent records, and evidence of the stress of competitive conditions. Whereas in former years minor changes have predominated, the manufacturers are now in many instances rebuilding almost the entire car.

Although the innovations to be introduced are still largely confidential, it is known that in the low-priced field there is a distinct trend to longer wheelbases, more power and the virtually universal adoption of four-wheel brakes. Less drastic changes are observed among higher-priced cars, but the effort to attain greater engine power is also in evidence in this field. Increased efficiency is being relied upon for much of the increase, but in many cases there are larger dimensions of bore and stroke.

Some notably quick changeovers to new models have been made at the factories. Production was necessarily interrupted, but not for long periods, and the low point in production reached in recent weeks was mainly to permit dealers to liquidate stocks.

Rumors of price cut are too general and persistent to be ignored, but there is as yet no evidence that a downward trend will be followed generally.

Packard Earnings Set New Quarterly Record

DETROIT, Dec. 28—Packard Motor Car Co. reports earnings for the quarter ended Nov. 30 as $5,533,268 after depreciation, Federal taxes, etc., which compares with $3,835,475 in the same quarter last year. The quarter was the largest the company has ever had, both in the point of earnings and production, shipments totaling 13,020 against 9046 in the 1926 quarter. Company assets at the close of the quarter included cash and securities in excess of $17,000,000. In the quarter ended Aug. 31, 1927, they were $10,076,000.

Rockhill Joins Miller, Goodyear Names Wilson

AKRON, Dec. 28—Five sales executives of the Goodyear Tire & Rubber Co., headed by L. C. Rockhill, general sales manager, have resigned to join Miller Rubber Co. Mr. Rockhill will become general sales manager of Miller, and he will be succeeded at Goodyear by R. L. Wilson. Others who have joined Miller are Fred Lohmann, assistant to Mr. Rockhill; W. C. Behoteguy, George Earseman and G. E. Brunner.

Car Tax Elimination to Stand, Says Smoot

WASHINGTON, Dec. 29—A prediction that the tax reduction bill, now before the Senate committee on finance, of which Senator Smoot is chairman, will be reduced from $290,000,000 to $250,000,000 was made this week by Senator Smoot.

The senator announced that the committee will hold its next meeting on Jan. 7 and will decide at that time the order in which it will take up the tax bill and the alien property bill. There is considerable pressure being brought to bear to take up the alien property bill first, Senator Smoot stated.

No decision has been reached, the senator declared, to postpone consideration of the tax bill, until after the March 15 returns have been made. He referred, he said, to suggestions to the effect that such a postponement might be decided upon in order to give the committee more definite information on probable revenues to guide the members in their determination of the total amount of reduction possible.

Senator Smoot expressed the belief that while $40,000,000 in reduction might be cut off the House bill, that there would be no change in the House's total elimination of the 3 per cent automobile tax. "The country seems pretty well organized against the automobile tax," Mr. Smoot said.

Bendix Brake Acquires "Hersot" Brake Rights

SOUTH BEND, Dec. 28—In furtherance of its policy of including European designs in its experimental development, Bendix Brake Co. has taken over the American rights for the so-called "Hersot" front brake control. This control has been in use for some time on axles produced by the Lemoine company of Paris, and is well-known abroad, but has not been used here.

In this control, a helically-wound shaft of spring material, ordinarily mounted on the axle, is used in applying the brake.

Steel Bodies Held Not Patentable

WASHINGTON, Dec. 29—A decision has just been handed down by the U. S. Patent Office holding that steel automobile bodies are not an invention that may be patented.

The decision is rendered in patent case No. 1,652,947. An application for a patent on steel automobile bodies was filed by Joseph Ledwinka on Nov. 3, 1919, and after eight years, the decision is just announced. The three examiners-in-chief who rendered the decision held that the patentee was merely attempting to acquire a monopoly which would cut off all future attempts of any other manufacturer to build a closed steel metal automobile.

E. B. Jackson Appointed Stutz Vice-President

INDIANAPOLIS, Dec. 28—Edwin B. Jackson, for many years president of the Packard Co. of New York and later vice-president of the Willys-Overland Co., has been appointed a vice-president of Stutz Motor Car Co. of America, Inc. He will assume charge of the eastern zone, making his headquarters in New York at the Stutz New York company.

All matters of sales policy in the territories of New England, New York City, Philadelphia, Washington and the East Coast will be entirely in Mr. Jackson's hands. The eastern business of the company has assumed such importance that it justifies the entire attention of a major executive, said E. S. Gorrell, vice-president, and the appointment of Mr. Jackson assures dealers intelligent cooperation.

AC Promotes McDougal

FLINT, Dec. 27—Taine G. McDougal has been appointed vice-president in charge of spark plug ceramic development of the AC Spark Plug Co., according to President B. W. deGuichard. Mr. McDougal will also have supervision of the company's foreign plants in Paris, France, and Birmingham, England.

M. J. Schmitt Promoted

MILWAUKEE, Dec. 28—M. J. Schmitt, formerly in charge of the Milwaukee branch of Kearney & Trecker Corp., has been promoted to the new position of assistant sales manager. He will continue to look after the Milwaukee territory.

New Whippet Prices Ready for Release

Revised List Will Make Car Keen Contender, Says Willys —Cites Economies

NEW YORK, Dec. 28—That there will be some real competition in the low-priced car field in 1928 was indicated by John N. Willys, president of the Willys-Overland Co., at a special press luncheon held in the Biltmore today. While new prices on the Whippet will not be announced until next week, Mr. Willys made it clear there would be real competition for the popular price market.

He stated that production economies equal to those of any other manufacturer in the industry had been worked out by Willys-Overland and that a new body-building plant and a new forge shop which have been completed this year and which are now in operation had effected marked savings in manufacturing costs.

The daily output of the plant will be around 1000 chassis a day at the beginning and it will be possible to step production up as demand warrants.

Mr. Willys said in part:

"It is not the intention of the Willys-Overland to enter into any direct price war with any one or any group of manufacturers in the light car field. The prices which we will announce and the improvements which we have made in the Whippet will, however, make it directly competitive with every car in the present light car class. The improvements are further developments of the features which have been characteristic of the Whippet.

"We have recently opened our new body-building plant which will save us not less than $5,000,000 a year in the body division alone. With its allied plants it will furnish employment for 3000 additional men. The new forge shop which we opened early last summer is the very last word in efficiency and has increased our production capacity in this department 100 per cent. Standardization of manufacturing processes and the introduction of new efficiency methods have reduced overhead and lowered costs.

"We are now building the Whippet which will be announced at the new prices and dealers will be able to make immediate deliveries. The factory will go on production schedule as rapidly as possible on a large volume basis which the new prices justify."

Allen and Levene Buy General Equipment Corp.

DETROIT, Dec. 27—The assets and good-will of the General Equipment Corp., Kalamazoo, have been purchased outright by G. H. Allen and H. H. Levene. The new personnel includes G. H. Allen, president and chief engineer; H. H. Levene, vice-president and general manager, and Homer J. Rowling has been placed in charge of sales.

The new owners controlled and operated the Allen Electric Mfg. Co., Detroit, previous to its merger with General Equipment. They announce there will be no radical change of policy and that they will continue a complete line of automotive shop equipment and market through recognized jobbers.

Peugeot Shuts Down German Operations

BERLIN, Dec. 27—The Peugeot company has closed its plant at Manheim where plans had been made to assemble 30 of these French automobiles daily. Under the new tariff the position of French assemblers is worse than Americans, said L. Schmidt, Peugeot's Berlin representative. American assemblers can save a difference in freight rates which is inconsiderable in the case of French companies owing to the short haul, said Mr. Schmidt.

German automobile manufacturers, notably Opel, which is planning to build 300 cars daily, mean to reduce prices to a point where Americans will scarcely be able to compete even by turning their present plants into fully equipped factories, said Mr. Schmidt, who formerly was German representative of General Motors Corp.

Willys to Continue Plant

NEW YORK, Dec. 28—Willys-Overland Co. will proceed with its plans for assembling cars at its recently erected plant in Germany despite the recent changes in tariff by that country, John N. Willys announced today. While definite statements were unobtainable from other manufacturers having assembly plants in Germany, it seems probable that a similar course will be pursued. It has been unofficially pointed out that this operation will still be cheaper than shipping assembled cars from this country to Germany.

New Tariff Specifies Rates

NEW YORK, Dec. 28—Under the new German tariff effective Jan. 15, chassis parts will be dutiable at 100 marks per 100 kilos, engine parts at 140 marks, and electrical and ignition equipment at 300 marks, according to advices received by the National Automobile Chamber of Commerce. Formerly, parts which could not specifically be designated as chassis, frames or engines, or other distinctive parts, were admitted under the tariff for the principal component material.

George F. Bauer, foreign trade secretary of the chamber, who has just returned from three months in Europe, said the German people need additional motor car transportation and this latest move will increase the cost. The use of motor vehicles is rapidly increasing and the German buyers are entitled to that transportation and the increased efficiency at the lowest possible cost.

Business in Brief

Written exclusively for* AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co.

NEW YORK, Dec. 29—The business situation during the past week has been characterized by developments incident to the holiday buying season and the approach of the time for year-end settlements. Both wholesale and retail trade were stimulated by more seasonable weather. November railway reports to date indicate that earnings for that month will be smaller than those of last year. Sales of new ordinary life insurance for the first 11 months this year are 2 per cent larger than in the comparable period of 1926. Wholesale prices in November declined 1/3 of 1 per cent from the level of the month previous and were 1¾ per cent below the average for November, last year. Employment figures at Detroit in the past week registered an increase over the previous week of 4200. Wheat has eased off during the week in consequence of a lag in export demand. Corn prices in the past week were also lower following a larger Government crop estimate than had been anticipated. A slight advance was recorded in iron and steel prices, while production schedules were also increased. During the last week it was announced that the Italian lira had been stabilized at 19 to the dollar.

FREIGHT CAR LOADINGS

Railroad freight car loadings in the week ended Dec. 10 declined, numbering 877,600, as compared with 918,237 in the previous week and 992,455 in the corresponding period a year ago. Total loadings so far this year amount to 50,077,882 cars, as against 51,393,662 cars in the same period last year and 49,553,353 cars two years ago.

PETROLEUM OUTPUT

Production of crude petroleum decreased during the week ended Dec. 17, average daily output for that period being 2,456,950 bbl., which compares with 2,487,500 bbl. a week earlier and 2,396,700 bbl. in the corresponding period a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices advanced to 145.1 last week, as against 144.3 in the preceding week and 146.1 four weeks earlier.

FEDERAL RESERVE REPORT

For the week ended Dec. 21 the Federal Reserve banks reported that discounts rose $83,200,000, and note circulation $54,700,000. Reserves declined $60,400,000, open market purchases $15,400,000, U. S. Government securities $9,900,000 and deposits $14,000,000.

Time money and commercial paper rates were fractionally changed last week at 4⅛ to 4¼ per cent and 4 to 4¼ per cent, respectively.

U.S. Adopts Standard for Bumper Heights

Division of Simplified Practice of Commerce Bureau Accepts S.A.E. Proposal

WASHINGTON, Dec. 27—Standardization of the height for automobile bumpers has been recommended by the division of simplified practice of the Department of Commerce, adopting a standard proposed by the Society of Automotive Engineers.

The S.A.E. standard for passenger-car bumpers, small motor-coaches and light delivery trucks is as follows:

"The horizontal centerline of bumper face, exclusive of fittings, shall be 18 inches plus or minus ⅜ inch per inch of effective face above the ground for front bumpers and 19 inches plus or minus ⅜ inch per inch effective face above the ground for rear bumpers or fender-guards.

"The minimum overall length of front bumpers shall be 60 inches on passenger cars having the standard 56-inch tread. The minimum dimension measured between the extreme ends of rear bumpers, or fender guards, shall be 60 inches on passenger cars having the standard 56-inch tread. The minimum vertical depth of bars for single-bar-type front and rear bumpers shall be two inches.

"The bumper height shall be measured with the car supplied with the normal amount of water, oil, and gasoline, but without passengers or other load. The vertical spread of contact face shall be the distance between the upper and lower edges of the outer-bumper elements, exclusive of any additional projection parts.

"The only way to make these standards effective is through adherence on the part of car manufacturers and car owners. It is urged that car owners check up on their bumpers to see if they are attached in accordance with the above standards. Those having bumpers installed after purchasing a car would do well to have them set according to these measurements," the Department of Commerce advises.

Gasoline-Alcohol Fuel Successful in Road Test

NEW YORK, Dec. 24—Recent road tests in stock cars on fuel made up of average motor gasoline to which was added 20 to 30 per cent of anhydrous alcohol, have demonstrated that this mixture makes for smooth operating conditions, easy pick-up, smooth acceleration on hills and freedom from knocks, according to William C. Moore of the United States Industrial Alcohol Co., in a report to the American Chemical Society.

The cars used in this test included Ford, Chevrolet, Buick, Jordan, Willys-Knight, Marmon and Stutz.

State Road Building Exceeds Federal Aid

NEW YORK, Dec. 24—The actual disbursement of Federal Aid funds during the fiscal year ending June 30, 1927, was $81,371,013, a reduction of about $6,000,000 below the preceding year. With two exceptions all states made large expenditures for highways other than those constructed under Federal Aid, the ratio being about two miles constructed by the States to each mile built with Federal cooperation.

New Merger Unites Parts Maker Group

MILWAUKEE, Dec. 24—Incorporation in Delaware of the Unit Corp. of America by Milwaukee interests has brought about a merger of plants and businesses of the Obenberger Forge Co. and the Dallmann Machine & Mfg. Co., and will mean the further consolidation of one Wisconsin and one Michigan concern shortly after Jan. 1, it is stated. The merger involves approximately $7,000,000. The Obenberger company manufactures drop-forgings, transmission gears and tractor attachments, while the Dallmann company's principal products are of the same character.

One of the concerns still to be acquired manufactures gasoline engines. The new concern, it is stated, will be the first concern in the United States to turn out all three of the principal units of a motor vehicle, namely, the motor, the transmission and the differential. W. H. Schmidt, president of the Dallmann company, becomes president of the Unit corporation. E. W. Edwards is vice-president; P. O. Dallmann, secretary, and George C. Moerschel, treasurer.

Duralumin Sales Double

SPRINGFIELD, MASS., Dec. 27—Sales of duralumin by the Baush Machine Tool Co. metal division, which holds the license to manufacture this metal for American use, will reach a volume for 1927 more than double that of 1926, according to plant officials. The principal gains have been in the automotive and aviation fields, where prospects for 1928 are reported as excellent for increased sales of the metal.

Madison to Junk Cars

MADISON, WIS., Dec. 24—Distributors and dealers here are the latest to attack the junk car problem by the formation of a separate corporation. This has been incorporated as the Automobile Salvage Co. of Madison, and has capitalization of $20,000.

G.M. Month's Sales Decreased to 80,539

Effect of Campaigns in October Bring Sharp Reduction in November

NEW YORK, Dec. 24—General Motors dealers sold 80,539 cars to consumers during November, as compared with 101,729 in November a year ago. Division sales to dealers during November were 57,621, as compared with 78,550 a year ago.

In his report on November sales, Alfred P. Sloan, president, said:

"In reporting our sales for the month of October, I called attention to the fact that that month showed an abnormally high record, having been influenced by aggressive sales campaigns which resulted in a sales figure considerably higher than the current sales trend for that month. I also stated that the result of this was to advance into that month business that otherwise would have been consummated in November.

"The figures now reported for November reflect these conditions, and in addition are lower than for November, 1926, by reason of the fact that last year sales campaigns similar to those of October this year were held in November. Sales of cars by General Motors dealers in November reflect suspensions occasioned by inventory taking, which is usual at this time, as well as by reduced production incident largely to a change of model in the Chevrolet division. This factor will also, in all probability, influence our December figures." Monthly comparisons follow:

Dealers Sales to Users

	1927	1926
Jan.	81,010	53,698
Feb.	102,025	64,971
Mar.	146,275	106,051
April	180,106	136,643
May	171,364	141,651
June	159,701	117,176
July	134,749	101,576
Aug.	158,619	122,305
Sept.	132,596	118,224
Oct.	153,833	99,073
Nov.	80,539	101,729

Divisions Sales to Dealers

	1927	1926
Jan.	99,367	76,332
Feb.	124,426	91,313
Mar.	161,910	113,341
April	169,067	122,742
May	173,182	120,979
June	155,525	111,380
July	136,909	87,643
Aug.	155,604	134,231
Sept.	140,607	138,360
Oct.	128,459	115,849
Nov.	57,621	78,550

Adds Electric Service

DETROIT, Dec. 27—Detroit Electric Car Co. has added a service department for parts, batteries and repairs for all makes of electric cars. The company will continue the Detroit Electric.

Cleveland Factories Increase Operations

Full Production by Feb. 15 Indicated by Statements of Officials

CLEVELAND, Dec. 24—Automobile factories, dormant for the past six months, will be awakened to full production by Feb. 15, leaders in the industry here predict.

Fisher Body Ohio Co. is leading the way in resumption of production, a statement by P. J. Mauck, local works manager, shows. During the past four weeks 2700 men have been called back to work, with a total of 4500 now employed. Peak production will be reached by Feb. 1 with 7000 workers, Mauck said.

Preparation of show models was completed this week by the Peerless Motor Car Corp. plant which is working part capacity. Full production will be resumed Jan. 3 with heavy January schedules ahead, it was said at the offices of Edward Ver Linden, president.

Jordan Motor Car Co. is turning out 25 cars a day, working at 50 per cent capacity. It will be back to normal between Feb. 1 and 15, officials said.

The Chandler Motor Car Co. plant is to close for inventory next week. Operations will be resumed Jan. 3 with from 1500 to 1800 employees. Full production is predicted before the end of the month by Sid Black, vice-president.

The F. B. Stearns Co. is preparing a large production program that will get under way early in February, according to H. J. Leonard, president, who has just completed his annual conference with distributors from all parts of the country.

Timken Orders Increase

CANTON, OHIO, Dec. 27—Factories of the Timken Roller Bearing Co. are preparing for the biggest month in more than a half-year in January, executives announced Thursday. Close to 2,000,000 bearings will be manufactured by the Timken company in January.

Sharp recovering of the bearing industry came the past few days with receipt of orders from many of the largest automobile manufacturers in the country. Requirements for January while not definitely known as yet will be placed at the local factories during the next week, officials said.

The Timken company, which makes Ford bearings by the thousands, expects Ford requirements for the month of January to be in excess of 25,000 sets, an official of the company said this week. Volume will also be swelled by large orders from Studebaker, Dodge, Buick, Hudson and Chrysler.

Based on the expected January business from Ford, production of the new Ford models will not get under way in any great volume until well into the spring.

Ford Announcement Cost About $2,000,000

NEW YORK, Dec. 24—Henry Ford and his distributors spent close to $2,000,000 in the announcement of the new car, according to Thomas H. Moore, associate director of the bureau of advertising of the American Newspaper Publishers Association, in an address before the League of Advertising Women last night. The automotive industry spent about $60,000,000 in advertising last year, according to Mr. Moore, and approximately one-half of this sum was expended in newspaper space.

New Company Acquires Western Malleables Co.

MILWAUKEE, Dec. 24—The Western Malleables, Inc., Beaver Dam, Wis., is a new corporation with $300,000 capital stock which has been organized by local bankers and business men to take over and resume the operation of the works of the Western Malleables Co., Beaver Dam, which is widely known in the automotive and railway fields. The plant was closed Oct. 15 and placed on the market by the estate of Lawrence Fitch, Milwaukee capitalist, who died a year ago. The works are now being overhauled and some changes made to permit of the production of gray iron as well as malleable castings.

The new company has engaged as president and general manager, James H. Slawson, who is resigning as general manager of the Chicago Malleables Casting Co. to accept the executive position at Beaver Dam. He formerly was associated with the National Malleable & Casting Co. and the old Joliet Railway & Supply Co. It is expected that production will be resumed Jan. 15 or Feb. 1, with virtually the entire force employed by the old concern. The works cover 15 acres and have an appraised value of $800,000.

Toledo Executives See January Trade Revival

TOLEDO, Dec. 24—Toledo employment has taken an upturn during the last week and although the total at work in automotive plants here is about 25 per cent less than at the peak earlier in the year the payrolls are only about 5 per cent under what they were last year at this time.

The Willys-Overland Co., has more than 8000 men on its payrolls and other automotive concerns are operating on very satisfactory schedules. Most of the executives see a considerable boom in business next year and are planning to get into stride early in January when sales stimulus of the motor shows is expected to be felt.

Automotive Buying Helps Steel Uptrend

Industry Buying is Marked by Avoidance of Forward Commitments

NEW YORK, Dec. 28—Steel producers are not permitting the holidays to interfere as much with production as is usually the case at this time of the year and operating schedules are on the uptrend this week. In spite of frequently heard remarks that automotive consumers do not play the leading part in the recovery that is making itself felt in the demand, all indications point to the fact that greater activity in the steel market is primarily due to better automotive buying.

While automotive consumers are anticipating to a moderate extent their early 1928 steel requirements they have by no means changed their policy of not stocking any steel and of avoiding all avoidable forward commitments. Consumers do not look for the market to turn more favorable to them in the first quarter than it has been this month, but they are not worrying greatly about conditions three months hence. If the steel market has by that time attained higher levels, it will be because of much broader demand for the products into which steel goes.

Pig Iron—Quite a fair tonnage of pig iron has been contracted for by Middle West automotive foundries during the second half of the month, and the market's undertone is a shade firmer.

Aluminum—Importers are awaiting more definite advices from Europe before taking a stand as the result of the domestic producer's latest price cut which eliminated the differential between the quotation for domestic virgin ingots and the so-called "outside market," making the price for 98 @ 99 per cent pure virgin ingots uniformly 24.30 cents at the resumption of business following the Christmas holiday. The domestic producer lowered his price for so-called "metallurgical" aluminum, ranging from 94 to 99 per cent pure, to 22.30 cents, a reduction of 1.70 cents. No. 12 alloy is ½ cent lower at 23 cents and 98 @ 99 cents rolling ingots are quoted at 23.90 cents. The reductions came as a surprise to the trade. The "Metallboerse" has been urging European producers for some time to be content with lower prices and to expand production in Germany. Remelted metal prices are unsettled.

Copper—Producers are striving hard to maintain the copper market at as close to 14 cents as possible. Demand for automotive brasses has improved.

Lead—The market is steady with the demand from storage battery manufacturers slightly better.

Zinc—Little change is noted in prices or volume of demand.

Marmon Meeting Jan. 3

INDIANAPOLIS, Dec. 27—The annual sales convention of Marmon Motor Car Co. will be held at the factory Jan. 3 and 4 and will be attended by 1500 distributors, dealers and their salesmen.

Men of the Industry and What They Are Doing

Nash Quality Meetings Hear Owner Suggestions

NEW YORK, Dec. 28—Conditions are set for a prosperous 1928 for the Nash Motors Co., in the opinion of E. H. McCarty, general sales manager. He points to the general predictions for a healthy year for 1928 and believes that Nash is in a position to take peculiar advantage of these conditions.

Among reasons which make it seem likely that Nash will profit to a large extent in 1928 prosperity are the close cooperation between the sale and production departments and the weekly "quality meetings." These meetings are held every Monday evening by the production department and every department having to do with Nash production and sales is invited. All suggestions and letters received from owners or dealers are considered and many valuable changes result from these meetings.

Ditzler Promotes Sales Heads

With a change by Ditzler Color Co. in the sales executive duties, Neil A. Fleming, formerly manager of all sales activities, will devote his attention exclusively to directing sales work in the manufacturer division. Ernest Hummitch, previously assistant sales manager, has been appointed sales manager of the distributor and export department, and Fred J. Schneider has been made assistant sales manager of the manufacturer division.

Link Belt Names Officers

The Link Belt Co. has appointed four new vice-presidents: George P. Torrence, George L. Morehead, Frank B. Caldwell and W. C. Carter. Mr. Torrence will be in general charge of Indianapolis operations and sales, Mr. Morehead in charge of Eastern operations and sales, Mr. Caldwell in charge of the Chicago plant and sales offices, and Mr. Carter in general charge of production at all plants.

De Lavaud Wins Award

Dimitri Sensaud de Lavaud, inventor of the automatic transmission exhibited at the recent Paris automobile salon, has been awarded the Monthyon prize by the French Academy of Science in recognition of his contributions to the problem of wheel shimmy and the independence of the front wheels of an automobile. M. Sensaud de Lavaud is a Brazilian of French origin.

Welch Joins Brogan

R. M. Welch has joined the staff of G. W. Brogan, Inc., as automotive service and tool expert. Mr. Welch has been in charge of all automotive vehicles of the Consolidated Gas, Electric Light & Power Co. of Baltimore for the past 14 years.

A. J. Brosseau Heads N.A.C.C. Truck Group

A. J. Brosseau, president of Mack Trucks, Inc., has been elected chairman of the motor truck committee of the National Automobile Chamber of Commerce, to succeed Windsor T. White. Mr. Brosseau will also succeed Mr. White as vice-president of the commercial car division of the chamber.

Starck to Go Abroad

W. A. Starck, chief engineer of the Badger Mfg. Corp., has signed a contract with a German syndicate to plan and equip a modern factory in Saxony, Germany, for the exclusive manufacture of automobile bumpers. Machinery will be of Mr. Starck's own design and will have capacity for 500 to 1000 bumpers daily.

Marmon Names Managers

Three new regional managers have been appointed by Marmon Motor Car Co.: Louis Logie in the Southwest with headquarters in Kansas City; R. B. Thornton in the Northwest with headquarters in Chicago, and W. W. Stillson in a central region with headquarters at Indianapolis.

Rumely on Latin American Trip

L. M. Rumely, vice-president and general manager of General Motors Export Co., will leave Jan. 2 to attend a sales conference in Cuba. Following this conference, he will tour through South American countries in the interests of the business, returning to New York early in March.

Roberts Goes to India

J. D. Roberts is en route to India where he will act as a district sales manager for the Ford Co. of India which is affiliated with the Ford Motor Co. of Canada, Ltd., and directs Ford sales and service in the Indian Empire. Mr. Roberts has been with Ford of Canada since 1919.

Schott Leaves U. S. Rubber

Sidney M. Schott has resigned as secretary of the tire development department of the United States Rubber Co., located at the Detroit plant. Mr. Schott had been connected with the company for 15 years.

Senator Ford N.A.C.C. Speaker

"Senator" Ford, well-known vaudeville and after dinner speaker, has been chosen as humorous speaker for the National Automobile Chamber of Commerce banquet during show week.

Houde Expands Operations to Meet Ford Business

BUFFALO, Dec. 27—The Houde Engineering Corp. has begun construction of its second large building within the last three weeks. The first addition, which adds 80,000 sq. ft. of floor space, is just going under cover. Foundation work will begin next week on the second large addition of similar construction, affording an additional floor space of 42,000 sq. ft. Simultaneously the Houde corporation is increasing its factory personnel.

These changes are made to take care of the Ford business as well as other large contracts which the company has recently obtained and will permit taking on other large accounts after the first of the year, William A. Clare, vice-president in charge of sales, said.

Kirk Named Sales Manager

W. P. Kirk, sales manager of the Pratt & Whitney Co., has been made general sales manager of Niles-Bement-Pond Co. and all its domestic divisions. Harold F. Welch, who has been sales manager of the Niles Tool Works Division, has been made sales manager of the New York territory of Niles-Bement-Pond Co. and its divisions and will act also as adviser to the president on sales matters. William Hunter has been appointed acting manager of the Philadelphia territory.

Hoff Goes to New York

E. F. Hoff has been transferred by the Lincoln Electric Co., Cleveland, from the welder division at Cleveland to the welder division at New York, where he will be in charge of welder service under the direction of G. N. Bull, district manager.

DePaolo With Reo Branch

Peter DePaolo, winner of the 1925 and 1927 American Automobile Association speedway championships, is now a full-fledged salesman on the force of the Reo factory branch in Los Angeles.

Spear Wins Selden Prize

First prize in a sales contest by Selden Truck Corp. has been awarded to C. A. Spear, New York State division manager, and W. L. Poffinberger, Ohio division manager, took second prize.

King Joins Chevrolet

Russel B. King has resigned as supervisor of purchases and special sales representative of the O. Armleder Motor Truck Co. to join Chevrolet Motor Co. as a factory representative.

Guthrie Joins G.M. Export

W. G. Guthrie has resigned as factory and production manager of Peerless Motor Car Corp. to join General Motors Export Co.

Paige-Detroit Name to be Graham-Paige

Stockholders to Act on Change Jan. 5 — Will Identify Grahams With Product

DETROIT, Dec. 27—A special meeting of stockholders of Paige-Detroit Motor Car Co. has been called for Jan. 5 to act on a proposed change in the name of the company from its present form to the Graham-Paige Motors Corp. The change in name is proposed to identify the company and its product more fully with the three Graham brothers who are now in control.

Entering 1928, the effect of the management of the Graham brothers upon the company will be more distinct. Since the purchase of control in May this year, the brothers have been perfecting plans for the company which they are now prepared to introduce. These will include changes in the product, announcement of which will be made for the New York show, and also general changes in the direction of the business.

The sales organization has been greatly strengthened in the past six months and an extensive sales and advertising campaign will be launched in support of the sales policies of the company.

Paige-Detroit Motor Car Co. was organized in 1909 with Fred O. Paige as president; Willis Buhl, vice-president; Gilbert Lee, treasurer, and William B. Cady, secretary. Fred O. Paige, for whom the company was named, was previously identified with the Reliance Motor Car Co. which was absorbed by General Motors Corp.

Harvey Hubbell, Jr., Now Hubbell Corporation Head

BRIDGEPORT, CONN., Dec. 27—Directors of Harvey Hubbell, Inc., today elected Harvey Hubbell, Jr., president and treasurer of the corporation to succeed his father, Harvey Hubbell, Sr., who died recently. The new president has been associated with his father in the management of the business for several years, holding the office of assistant secretary. No changes in the established policies of the company are contemplated.

Harvey Hubbell, Sr., formerly president and treasurer died Dec. 17 of pneumonia, aged 69 years. Mr. Hubbell was a pioneer in the invention of electrical devices and he also was the first to make rolled thread machine screws with automatic machinery.

H. F. Snively

TOLEDO, Dec. 27—H. F. Snively, Atlanta district sales manager of the Champion Spark Plug Co., died suddenly Dec. 20 of acute indigestion at Greensboro, N. C., while on a business trip.

Federal Exports 20% of Total Production

DETROIT, Dec. 27 — The biggest export month in the history of Federal Motor Truck Co., was reported for November. Overseas sales of Federal trucks exceeded those of any previous November, both in number of units and in sales volume. Export sales now constitute more than 20 per cent of Federal's total volume. Overseas business for 1927, despite a somewhat dull year in domestic markets, was very close to the high record set the previous year.

Raskob Says Factors Favor 1928 Business

WASHINGTON, Dec. 24—A prediction that general business conditions during 1928, based largely upon improved agricultural conditions will show a marked improvement, is made by John J. Raskob, chairman of the finance committee of General Motors and vice-president of E. I. duPont de Nemours Co., Inc., who is chairman of a committee of 30 business men who have just completed a survey of 1928 business prospects for the United States Chamber of Commerce.

Mr. Raskob's summary of the outlook is as follows: "I expect that 1928 will be a better business year than 1927. In fact, there is good reason to anticipate that 1928 will witness the greatest prosperity our country has ever enjoyed. There is little, if any, inflation anywhere, an abundance of credit, a material increase in farm purchasing power as a result of good crops and prices, generally small inventories, and at least a moderate upward trend of the general price level with the greatest strength in recent months occurring in agricultural prices. These are all factors favorable to business expansion."

Westinghouse Brakes on Chandler

CLEVELAND, Dec. 27—Due to the adoption of Westinghouse vacuum brakes as standard equipment on Chandler models, the following price revisions have been made: Royal Six sedan, now $1,725; Metropolitan sedan, $1,525; Invincible sedan, $1,085; Special Six regular coupe, $1,055; rumble seat coupe, $1,155; Special Six cabriolet, $1,215; Special Six sportster, $1,165.

Take Over Martin Tire

MILWAUKEE, Dec. 24—The Milwaukee Rubber Products Co., capital stock $100,000, has been organized by Ralph P. Hammond and associates to take over the business of the Martin Tire & Rubber Co., manufacturer of industrial and commercial car tires.

Studebaker to Build Eight in 4 Models

Standard Sedans List at $1,985 and De Luxe $2,250 — Wheelbase 131 Inches

SOUTH BEND, Dec. 29—The new President straight-eight, of the Studebaker Corp. of America, will be made in four body models, standard five and seven-passenger sedans listing at $1,985, and de luxe editions of the standard sedans listing at $2,250. The wheelbase is 131 in. and four-wheel Bendix three-shoe brakes are used.

The engine, of the short stroke type, has a bore and stroke of 3⅜ by 4⅜ in., and develops 100 hp. at 3000 r.p.m. maximum. Piston displacement is 313 cu. in., horsepower rating 36.45, and the engine speed at 60 m.p.h. is 2800 r.p.m. Bohnalite invar-strut pistons are used. The transmission is in unit with the engine; the clutch incorporates the Long Mfg. Co. vibration damping plate and the rear axle is semi-floating with relatively low gear ratios.

The frame is unusually rigid. Pressed of 5/32 in. steel, the side members are 8 in. deep with 2½ in. flanges. There are six cross members, all channel cross-members which are over 5 in. wide being reinforced by plates under the channel opening. Four-point engine suspension contributes to frame rigidity. The rear cross member consists of a wide plate which serves also as a gasoline tank cover.

Body construction is combination wood and steel, the front end being of the clear vision all-metal type. Upholstery is two-tone broadcloth or mohair, with seats form-fitting in shape, having double deck seat springs.

Standard equipment includes Hershey coincidental steering and ignition lock, draw shades, toggle grips, arm rests, vanity case and smoking set, cigar lighter in rear compartment, double filament headlight bulbs, cowl lights and band, dome and rear corner light, rear traffic signal, automatic windshield wiper, rear vision mirror, clock, electric dash gasoline gage, dash engine thermometer, trunks on five-passenger and folding racks on seven-passenger models, Monroe hydraulic shock absorbers front and rear, bumpers front and rear. All exterior hardware is chromium plated. The de luxe models are equipped with six wire wheels.

D. O. James Awards Prize

CHICAGO, Dec. 27—D. O. James Mfg. Co. has awarded the prize in its Speed Reduction Guessing Contest staged during the New York Power Show to A. R. McMahan of the Troy Engine & Machine Co., Troy, Pa. The actual reduction of the James combination reduction drive consisting of a planetary spur, worm and continuous herringbone type unit was 16,852.401:1. Mr. McMahan's guess was 16,850:1.

1927 Parts Exports Seen Setting Record

Ten Months' Total Approximates All of 1926—German Gain 475%

WASHINGTON, Dec. 28—All previous exports of automobile parts and accessories will be broken this year, according to preliminary figures compiled by the United States Department of Commerce, which show that during the first 10 months of this year a total of $54,494,757 in parts were exported compared with $52,000,000 exported for the entire 12 months of 1926. The nearest approach to the current year's exports will be 1923, when the total automotive exports aggregated $55,768,743. Comparing the first 10 months exports with the exports for the first 10 months of last year, the current figures show an increase of 24.86 per cent this year.

The leading countries of automotive exports are Canada, taking $6,909,000; United Kingdom, taking $5,864,000; Germany taking $5,688,000; Australia, taking $3,701,000, and Argentina, taking $3,427,000. Of this our imports to Germany, our third best customer this year, during the first 10 months of 1926, totaled $969,000. Comparing the 10 months' exports of 1926 with the 10 months of this year, the figures show an increase of automotive imports by Germany of 475 per cent. All countries increased their purchases of automobile accessories excepting Argentina, which showed a decrease of 13 per cent.

Austin Company Earnings Increase Third in Year

LONDON, Dec. 12 *(by mail)*—The Austin Motor Co. shows a net profit of £406,469 on its year's working up to Sept. 30 last. This compares with £317,907 during the preceding 12 months, though it is subject to the deduction of £290,829, which goes towards wiping off the debit balance in the profit and loss account shown before the reorganization of capital was completed this year, the remainder of that debit being dealt with by a reduction in the face value of two classes of shares. For the first time for seven years the company's accounts permit a dividend to be paid on the 7 per cent first preference shares (£250,000) on which seven years arrears are to be paid on Dec. 31. No dividend is to be paid, however, on the remaining £1,900,000 share capital.

The directors say they expect to be able during the present financial year to make substantial payments on account of the arrears of dividend on the 6 per cent second preference shares (£1,000,000). They state, too, that increased demand has outgrown the capacity of the Birmingham plant and that considerable extensions have become necessary.

New Zealand Show is Held in Church

WASHINGTON, Dec. 28—Automobiles and religion have a close alliance in New Zealand, according to a cable to the United States Department of Commerce from its representative in Wellington. He reports that the New Zealand ninth annual Motor Olympia was held in Christ Church, from Nov. 4 to Nov. 12, the edifice being completely filled with automobiles, the majority of which were of American make. Out of a total of 92 passenger cars shown, 61 were made by American manufacturers, 28 by British, and 3 by Italian manufacturers. The idea of the show in the church was hit upon by the dealers as a unique advertising possibility for the show and was received with enthusiasm by the churchmen as a means of raising a tidy revenue for the church.

French Want Roads Fixed From Car Tax

PARIS, Dec. 10 *(by mail)*—French automobile taxation, including direct car taxes, gasoline and oil import taxes, totalled 2,251,942,000 francs last year, of which amount the government spent 668,497,000 francs, on road maintenance. Estimates based on returns for the first three quarters of this year indicate that the 1927 taxation returns will show an increase of 250,000,000 francs.

Vigorous protests are being raised against the government policy of employing more than $63,000,000 on automobile taxes for general purposes at a time when urgent road repairs are required, and a scheme is being put forward for an annuity of $10,000,000 for four years, this to be drawn from the present excess taxation, for the remaking of national highways. The leading point in this campaign, for which the Automobile Club de l'Ouest of France is making itself responsible, is that it is unjust to levy more taxes on automobile owners when the government is receiving $63,000,000 annually more from them than it is spending on highway maintenance.

I.C.C. Hearing Postponed

WASHINGTON, Dec. 25 — Oral arguments on the examiner's report to the Interstate Commerce Commission of its findings in respect to Docket 18300 under which the commission's investigation of the relationship of motor trucks and buses to the business of the railroads was instituted, has been postponed from Jan. 16 to Feb. 10.

Pickwick to Operate Coast-to-Coast Buses

Sleeping Car Stages Will Supplement Present Equipment —Builds Hotel System

SAN FRANCISCO, Dec. 27—Early establishment of motor-stage lines operating between San Francisco and New York is announced by the Pickwick Stages System, Inc. Sleeping car stages to supplement the present dining-car and buffet-car operations, are included in the announcement. This corporation, which developed in California, is one of the largest, if not the largest, engaged in motor transportation of passengers in the United States. It now operates stages on regular schedule connecting San Francisco and Los Angeles with St. Louis. Early in the spring, this same service will be extended to Chicago, and as quickly thereafter as the specially-built cars can be supplied, it will be shoved on to the Atlantic seaboard.

Paralleling this extension of routes, the Pickwick System announces the development of much larger and better rolling stock and finer equipment than ever attempted on any motor-stage line in this country. A Pickwick subsidiary company is now building these sleeping cars, more diners, and other coaches for day travel alone. Incidental service to be established between the Pacific and Atlantic coasts calls for a complete transcontinental chain of hotel terminals, either owned or leased by the Pickwick System, for over-night stops by the day-only stages. These hotels, and the luncheon stops along the highways, will be equipped with chain eating houses.

Swedish Maker Builds 11 hp. Electric Truck

WASHINGTON, Dec. 24—A new electric truck has been brought out by the Asea company, a Swedish manufacturer, according to a report to the U. S. Department of Çommerce. It is an 11 hp. model having an operating distance of 60 to 70 kilometers on each charge, with a maximum capacity of 2.5 tons and a speed of 15 to 20 kilometers per hour.

The department is advised that because of the availability of cheap electric current throughout Sweden, that the new truck promises to meet with considerable success. A new arrangement has been introduced whereby the conductors, attached to the battery while charging, are automatically disconnected when the battery is fully charged.

Ditzler Plant Moved

DETROIT, Dec. 24—Ditzler Color Co. has removed its offices and plant to its new property at 8000 West Chicago Blvd., where it will have increased facilities for operation.

Super Highway Bill Offered in Senate

Provides For Direct Cross Country Route and Connections to All States

WASHINGTON, Dec. 24—The construction of an elaborate system of super highways spanning the United States, and greatly enlarging the Federal Aid Highways program, which calls for the ultimate construction of 182,000 miles of Federal aid road, was asked in a bill introduced this week in the Senate by Senator George H. Moses, of New Hampshire. In introducing the measure, Senator Moses stated that he had done so on behalf of Senator Coleman duPont of Delaware.

The bill provides for a highway as direct as practicable between the Atlantic and Pacific coasts and cross highways which would connect the entire United States. In addition to the coast-to-coast highway, provision also would be made for a report on similar highways from Maine to southern Florida along the eastern seaboard, from the State of Washington to southern California; from southern California through the Southern States to meet the eastern seaboard highway; from a point west of the Mississippi River, running northwest to meet the Pacific seaboard highway in the State of Washington and from the central super highway to meet the southern artery.

Senate Gets Bill Adding $50,000,000 to Road Fund

WASHINGTON, Dec. 27—The expenditure of $125,000,000 a year for Federal-aid highways and rural post roads, is provided for under the terms of a bill introduced in the Senate this week by Senator L. D. Tyson of Tennessee. The measure would continue the $75,000,000 provided annually for Federal-aid under the Federal-aid program, but would amend the existing law so as to provide $50,000,000 a year to be appropriated to each state provided each state appropriates a like amount.

The measure provides for $50,000,000 for the fiscal year ending June 30, 1929, and $50,000,000 for the fiscal year ending June 30, 1930, both of these sums being in addition to the Federal-aid program. The money would be expended in the same way as the $75,000,000 Federal-aid each year.

Offers Wide Roads Bill

WASHINGTON, Dec. 24—Construction of a nation-wide system of hard-surfaced post roads is called for in a good roads bill introduced in the House this week by Representative William P. Holaday, of Illinois. The roads would range in width from 20 to 40 ft. for at least 25 miles out from any city of over 200,000 population. Wherever practicable out of larger cities the roads would be 60 ft. wide.

Meetings and Events Scheduled for Week of New York Automobile Show

FRIDAY, JAN. 6

Stutz Motor Car Co. of America, Inc., Salesmen's and Dealers' Meeting, Branch Office ..... 8.00 p.m.

SATURDAY, JAN. 7

Hupp Motor Car Corp., Luncheon and Meeting, every day, Commodore Hotel.

Studebaker Corp. of America, Dinner, Hotel Plaza ..... 7.00. p. m.

MONDAY, JAN. 9

American Automobile Association ,Contest Board, Roosevelt Hotel .....10.00 a. m.

National Automobile Dealers Ass'n Eastern Districts Convention, Commodore Hotel .....10.00 a. m.

Oakland Motor Car Co., Meeting, Roosevelt Hotel 1.00 p. m.
Banquet, Roosevelt Hotel. 6.30 p. m.

Rubber Association of America, Inc., Meeting and Luncheon, Commodore Hotel .....10.00 a. m.
Dinner, Commodore Hotel. 7.00 p. m.

Society of Automotive Engineers, Metropolitan Section Show Dinner, Commodore Hotel ..... 6.30 p. m.
Meeting, Commodore Hotel 8.00 p. m.

John N. Willys' Luncheon to Trade and Newspapermen, Biltmore Hotel .....12.30 p. m.

TUESDAY, JAN. 10

American Automobile Association, Board of Directors Meeting, Roosevelt Hotel..10.00 a. m.

National Association of Automobile Show and Association Managers, Luncheon, Waldorf-Astoria..... 1.00 p. m.

National Automobile Chamber of Commerce Banquet, Commodore Hotel ..... 6.30 p. m.

Packard Motor Car Co., Meeting and Luncheon, Packard Distributors and Dealers, Biltmore Hotel, 9.00 a. m. to 5.00 p. m.

Paige-Detroit Motor Car Co., Luncheon, Roosevelt Hotel Noon

WEDNESDAY, JAN. 11

American Automobile Association, Bus Division, Roosevelt Hotel .....10.00 a. m.

Auburn Automobile Co., Luncheon, Commodore Hotel ..... 1.30 p. m.

Cadillac Motor Car Co., Dinner, Hotel Astor ..... 7.00 p.m.

Chevrolet Motor Co., Business Meeting, Mecca Temple ..... 1.30 p. m.
Banquet Commodore Hotel ..... 6.30 p. m.

H. H. Franklin Mfg. Co., President's Luncheon, Commodore Hotel ..... 1.00 p. m.

Gardner Motor Co., Luncheon and Meeting, Hotel Belmont ..... 1.00 p. m.

Motor & Accessory Manufacturers Ass'n, Annual Meeting, Hotel Astor..... 2.30 p. m.
Banquet, Hotel Astor..... 7.00 p. m.

Nash Motors Co., Warren-Nash Motor Corp., Dealer Meeting.

Olds Motor Works Business Meeting, Mecca Temple... 1.00 p. m.
Show Dinner, Hotel Biltmore ..... 7.00 p. m.

Packard Motor Car Co., Meeting and Luncheon, Packard Distributors and Dealers, Biltmore Hotel, 9.00 a. m. to 5.00 p. m.

Peerless Motor Car Corp., Dinner, Commodore Hotel 6.30 p. m.

THURSDAY, JAN. 12

Overseas Automotive Club, Dinner, Hotel Astor ..... 6.30 p. m.

Society of Automotive Engineers, Dinner, Hotel Astor ..... 6.30 p. m.

Velie Motors Corp., Luncheon and Business Meeting, Commodore Hotel ..... 1.00 p. m.

Willys-Overland, Inc., Dealer Meeting and Banquet, Hotel Astor

Railroad Asks Bus Permit

NEW YORK, Dec. 24—A petition to substitute bus and truck service for four daily trains operating a 94-mile line between Tyler and Lufkin, Tex., has been filed with the railroad commission by the Cotton Belt. This would leave one mixed train a day operating over this line to enable the company to maintain its charter. In the petition the Cotton Belt points out that operation of these four trains entails a loss of something like $30,000 a year.

Tripp-Secord Moves

DETROIT, Dec. 24—Tripp-Secord & Co. has moved into its new plant at Woodbridge & Beaubien Sts., this city, and is now in full production.

Patterson and Glennon Head N.S.P.A. Committees

DETROIT, Dec. 24—The appointment has been made of two important committees of the National Standard Parts Association.

The membership committee for 1928 will be composed of Burke Patterson, chairman, Thompson Products, Inc.; Burt Close, King Mfg. Corp.; W. G. Hancock, McCord Radiator & Mfg, Co.; V. C. Anderson, Motor & Axle Parts Service; R. H. Bachman, Bee Automobile Co., and H. H. Rudnick.

The merchandising and standardization committee is made up of: F. J. Glennon, chairman, Aluminum Industries, Inc.; S. F. Dupree, Jr., Almetal Universal Joint Co.; J. T. Spicer, Johns-Manville Corp.; Jack Buckley, Port Huron, Mich.; A. E. Parrish, Nashville, and S. M. Stewart, Gastonia, N. C.

Continental to Give Sedan for Slogan

DETROIT, Dec. 27—Continental Motors Corp. will give away a Continental engine equipped sedan of one of the most desirable makes in connection with the New York and Chicago automobile shows. The contest is not only open to all persons attending the shows, but to every man, woman and child in the United States and Canada, except persons connected with Continental Motors, directly or indirectly, or with automotive trade publications.

The prize will be awarded to the person who submits the neatest and most accurate list of cars, trucks and buses and other road vehicles produced today and equipped with Continental engines, and who in addition offers the best sales slogan of not more than five words for Continental engines.

Contestants may obtain booklets explaining the contest at the New York or Chicago show or may secure them by writing the contest manager, Continental Motors Corp. at Detroit. All booklets must be mailed to the contest manager at the Detroit offices before midnight of Tuesday, Feb. 14.

Judges for the contest will be men who are not connected with Continental Motors and who are widely known for their integrity and automotive knowledge. Names of the judges and further developments concerning the contest will appear in Continental advertising in the daily newspapers prior to and during the national automobile shows. The make of car to be given will be announced later.

Navy Buys Loening Planes

WASHINGTON, Dec. 27—A contract for the purchase of 20 airplanes at a price of $503,003 was placed, this week, by the Navy Department with the Loening Aeronautical Engineering Corp. of New York. The planes are equipped with 420 hp. air-cooled engines manufactured by the Pratt & Whitney Motor Corp. Specifications require that the planes measure 45 ft. between wing and tips, weigh 3249 lb., and carry a normal load of 1500 lb., to be operated by a crew of three, having a speed of 125 m.p.h., and a cruising radius of 560 miles.

Coming Feature Issue of Chilton Class Journal Publications

Feb. 18—Statistical Issue—Automotive Industries.

Baker Says Future Car To Be More Mechanical

TOLEDO, Dec. 24—The motor car of the future will have engines that will do mechanically the heavy tasks of shifting gears, applying brakes and such functions in the opinion of A. J. Baker, chief engineer of the Willys-Overland Co., who addressed a group of mechanical engineers in Toledo at one of their monthly meetings.

The automobile of the near future will have six high compression cylinders of small bore, a new type of cooling system, two pairs of headlights, four-wheel brakes and automatic gear shift, he indicated. But after that there will still be room for improvement in the keeping of oil and motors at even temperature in cold or hot weather varying conditions.

Mr. Baker indicated that many of the improvements will probably come from Europe where engineers are doing more efficient work in experimenting with revolutionary ideas. It will be a long time before the poppet or sleeve valve gasoline engines are replaced by any other type of power unit, he prophesied.

A.E.R.A. Picks Cleveland

NEW YORK, Dec. 27—The exhibition and forty-seventh annual convention of the American Electric Railway Association will be held in the Cleveland Public Auditorium Sept. 22 to 28 inclusive, 1928. This will make the third successive year that Cleveland has been selected as the A.E.R.A. convention city.

Shows Radiator Ornaments

NEW YORK, Dec. 28—A catalogue for release in January which lists over 300 new artistic radiator ornaments for automobiles is announced by the Irving Florman Co., New York.

French Grand Prix Canceled For 1928

PARIS, Dec. 10 *(by mail)*—The annual French Grand prix automobile race has been taken off the program for next year, according to an official announcement made by the national club. The race had been scheduled for July, on a road circuit near Toulouse, but in view of the uncertainty regarding entries the decision has been taken not to run it. Bugatti was the only French maker willing to give an assurance that he would start. Delage and Talbot announced that they had quit racing for a certain length of time. Fiat, Mercedes and Alfa Romeo had shown a certain amount of interest; but there was no assurance that they would start in the race. The cause of the failure of the French Grand Prix race must be found in high cost of building modern racing cars and small monetary and advertising returns. A race for the Sporting Commission Cup, held under limited fuel rules, has been retained.

Originated in 1906, immediately after the Gordon Bennett event had been killed by the French club, the Grand Prix was held in 1906, 1907, 1908, 1912, 1913 and 1914 and was revived in 1921, when it was won by Murphy on a Duesenberg. It has been held every year since, but always with a reduced number of entries and lessened interest.

Crowner Opens Offices

NEW YORK, Dec. 27—The Crowner Co. has established district sales offices in the General Motors Building, Detroit, and the Wysor Building, Muncie, Ind. The Detroit office is in charge of E. D. Williamson who was formerly with the Cleveland Tractor Co. D. O. Skillen, formerly general manager of the Muncie Products Co., is the Muncie sales representative.

Montreal Show Jan. 21

WASHINGTON, Dec. 28—The National Motor Show of Eastern Canada and the Montreal Motor Show will be held in the Motordrome Building in Montreal, Jan. 21 to 28, under the auspices of the Montreal Automobile Trade Association, Ltd.

Calendar of Coming Events

SHOWS

All Western Road Show, Los Angeles, March 7-11
American Road Builders Association, Public Auditorium, Cleveland..Jan. 9-13
*Boston, Mechanics Bldg.....March 10-17
*Chicago, National Automobile Chamber of Commerce, Coliseum, Jan. 28-Feb. 4
Copenhagen .....Feb. 23-March 4
International Aircraft Show, Berlin, March 23-April 11
*New York, National Automobile Chamber of Commerce, Grand Central Palace .....Jan. 7-14
Rio de Janeiro.....May 3-13

*Will have special shop equipment exhibit.

Salon, Automobile Salon, Inc., Hotel Drake, Chicago .....Jan. 28-Feb. 4
Salon, Automobile Salon, Inc., Hotel Biltmore, Los Angeles.....Feb. 11-18
Salon, Automobile Salon, Inc., Palace Hotel, San Francisco..Feb. 25-March 3
United States Good Roads Show, Des Moines .....May 28-June 1

CONVENTIONS

American Road Builders' Assn., Hotel Hollenden, Cleveland .....Jan. 9-13
American Road Builders' Association, Banquet, Hollenden Hotel, Cleveland .....Jan. 11
Automotive Equipment Association, Grand Hotel, Mackinac Island, June 10-16
National Automobile Dealers Ass'n, Annual Meeting, Palmer House, Chicago. .....Jan. 31-Feb. 2.
National Battery Mfrs. Assn., Chicago, Feb. 15-16
National Foreign Trade Council, Houston, Texas .....April 25-27
Society of Automotive Engineers, Annual Meeting, Detroit.....Jan. 24-27
United States Good Roads Association and Bankhead National Highway Association, Des Moines.May 28-June 1

RACE

Daytona Beach, Fla., series of stock car races and world's speed trials, Feb. 15-23

Faster, smoother performance

Longer Life, Less Maintenance, These Features Demand Better Bearings

HIGHER car speeds, the demand for silent, economical performance, and the tendency of the present-day driver to use his car harder and service it less are all features that mean severe duty for each component part of the design, with principal emphasis on the bearings. Super-Strom Ball Bearings are meeting these conditions daily. Their extra strength, their inherent ability to take shock loads, their unusually long life without wear are features which make them equal to all service requirements.

The latest catalog, giving complete data on all types and sizes, will be sent upon request.

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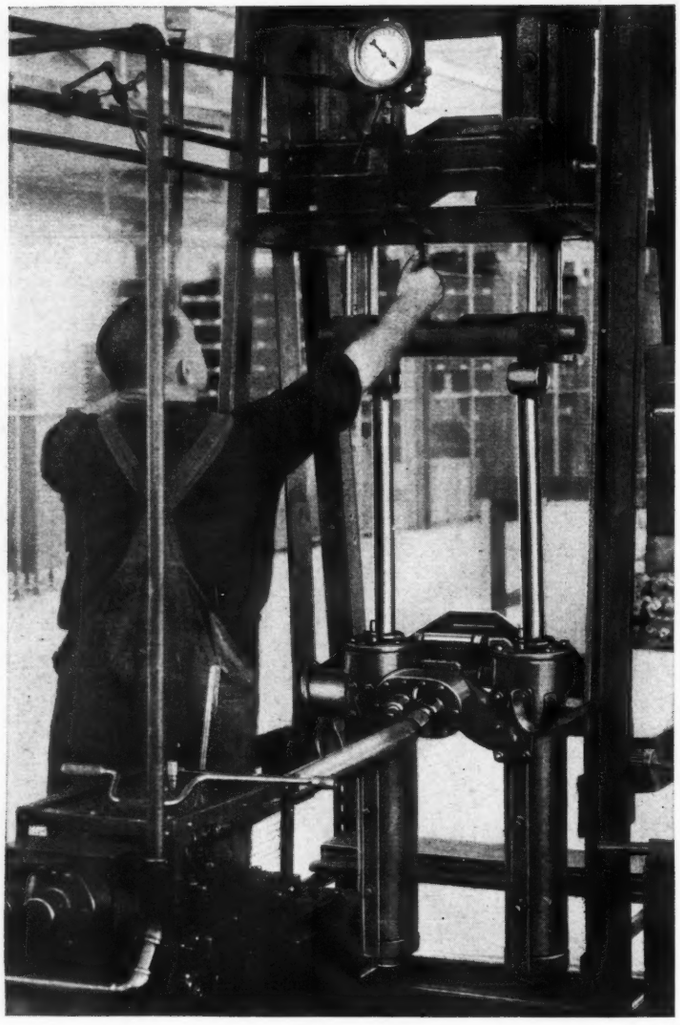

Heil Hoists Tested at Factory

Testing Heil Hydro Hoists with special apparatus at the Heil factory, Milwaukee. The tested lifting capacities for the various models are as follows:

Model 3-26—4 " bore for 2 -3 ton trucks— 7 ton
Model 4-26—4¾" bore for 2½-3½ ton trucks—10 ton
Model 5-26—5¾" bore for 3½-5½ ton trucks—16 ton
Model 6-26—7 " bore for 6 -7½ ton trucks—23 ton

THE lifting capacities of all Heil Hydro Hoists are carefully tested before any hoist is permitted to leave the factory. Special machinery was designed so as to enable Heil to *know* what each hoist unit will do in the way of raising and holding a load. When testing for raising a load, the hoist is run up against pressure in an upper hoist which is part of the apparatus. When testing for holding a load, the valve is closed on the hoist being tested and the upper pistons are lowered against it at a pressure equivalent to loads far in excess of the carrying capacity of the truck. Factory tests, therefore, backed by precision methods of manufacturing, explain *why* Heil builds the only hoist sold under a written two-year Guarantee. Send for graphic story in Bulletin 160.

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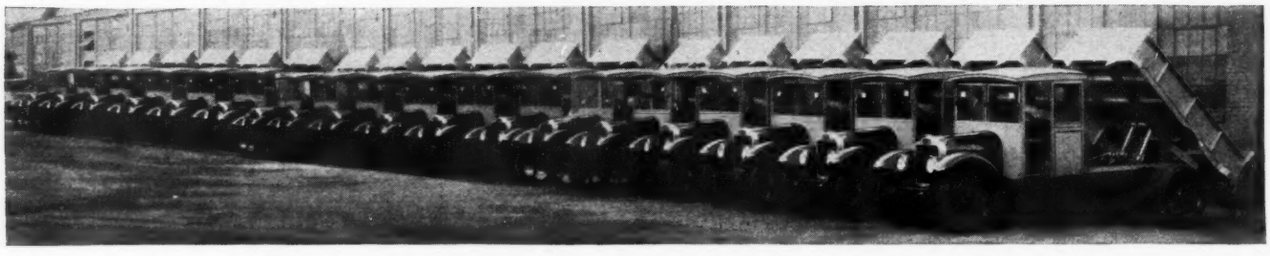
Manufacturers of
BODIES, HOISTS, TANKS



Pennsylvania State Highway Commission fleet of White trucks with model 4S-26 Heil Hydro Hoists and 2½ yard model 11 Heil Bodies.

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Established 1902

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industries

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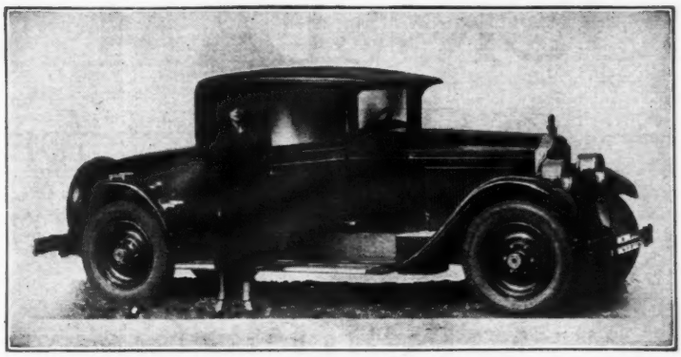

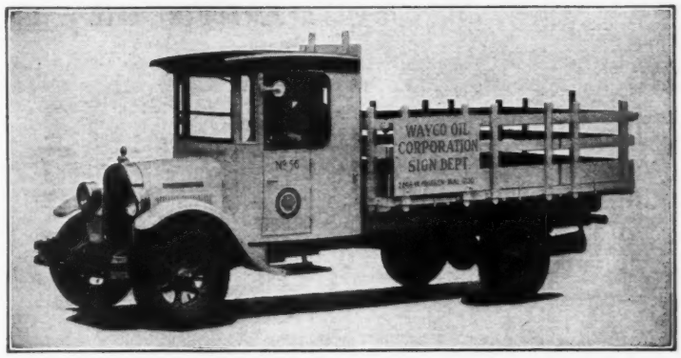

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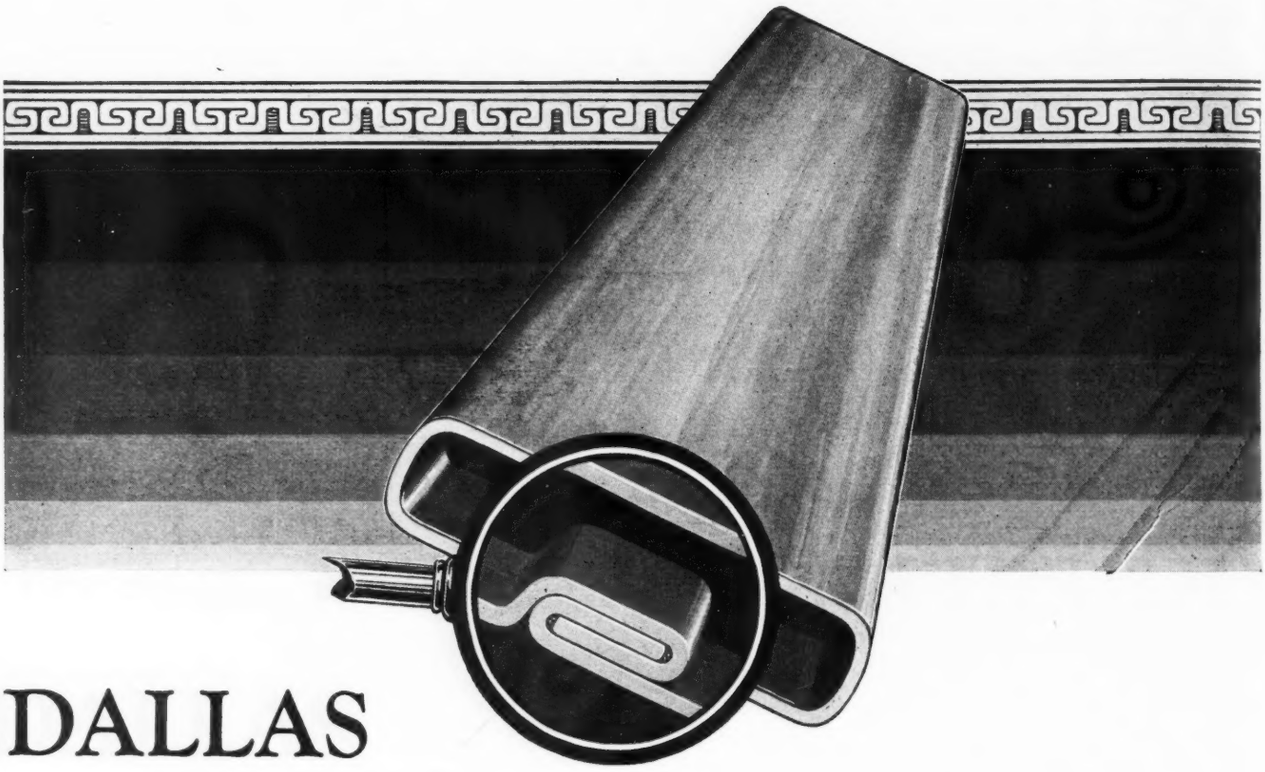

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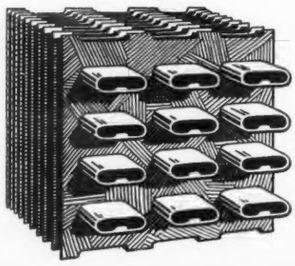
Only Is Best for Radiator Construction

Greater - *Cooling Capacity*

Strength-Durability-Economy

That same service and cooperation which built the Dallas reputation is available for you today.



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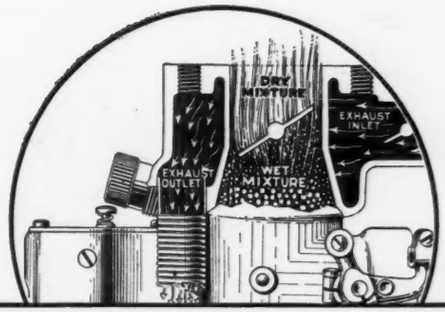
MARVEL

Carburetion



Preheated RIGHT at the throttle

Under Automatic Control

A system that Entails Perfect Co-ordination of THE TWO MAJOR DIVISIONS of Carburetion—Metering and Proper Vaporization.

A CARBURETER UNIT designed to provide efficient metering of the fuel in all phases of engine operation.

A VAPORIZING UNIT, utilizing the exhaust gases, designed to automatically control the mixture temperature to any PREDETERMINED requirement. (This range of automatic control provides dry mixture where required and will not reduce the maximum power on wide open throttle.)

RESULTS

1 Standard performance throughout the year, in winter or in summer, with maximum fuel economy regardless of weather conditions.

2 No winter or summer seasonal adjustments of the mixture ratios — one standard setting that has been accurately established, and all carbureters individually checked to same on fuel flow meters before leaving factory.

3 Full use of the exhaust heat from all cylinders reduces the time element for "Winter Warm Up" to a negligible factor, and prevents a useless waste of gasoline.

4 This Marvel advantage means — minimum choker manipulation, less carbon deposits and freedom from plug and valve trouble.

Marvel Heat Control insures maximum volumetric efficiency and power output from the engine at all times

BUICK, NASH, OAKLAND AND HUDSON CARS USE MARVEL HEAT CONTROL SYSTEMS

Marvel Carbureter Company

FLINT, MICHIGAN

fifteen years of Bearing Satisfaction

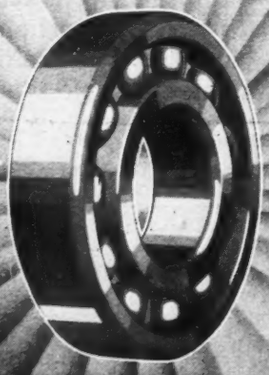
"WE are specifying New Departures for 1928 production," says Mr. A. C. Wollensak, Chief Engineer of the Sterling Motor Truck Company, "because for the past fifteen years the Sterling transmission has been assembled with them. These bearings have proved entirely satisfactory."

Engineering experience has proved that only the ball bearing performs these important duties:

Shaft alignment without change; lifetime service without adjustment; no excess heat generation to crack cases; no temporary failure of the oil flow can ruin it — things that cannot truthfully be claimed for any other bearing.

Vehicles with New Departure-equipped transmissions are built for better service above all other considerations.

THE NEW DEPARTURE MANUFACTURING CO.
BRISTOL, CONNECTICUT
Detroit San Francisco Chicago



New Departure Quality Ball Bearings

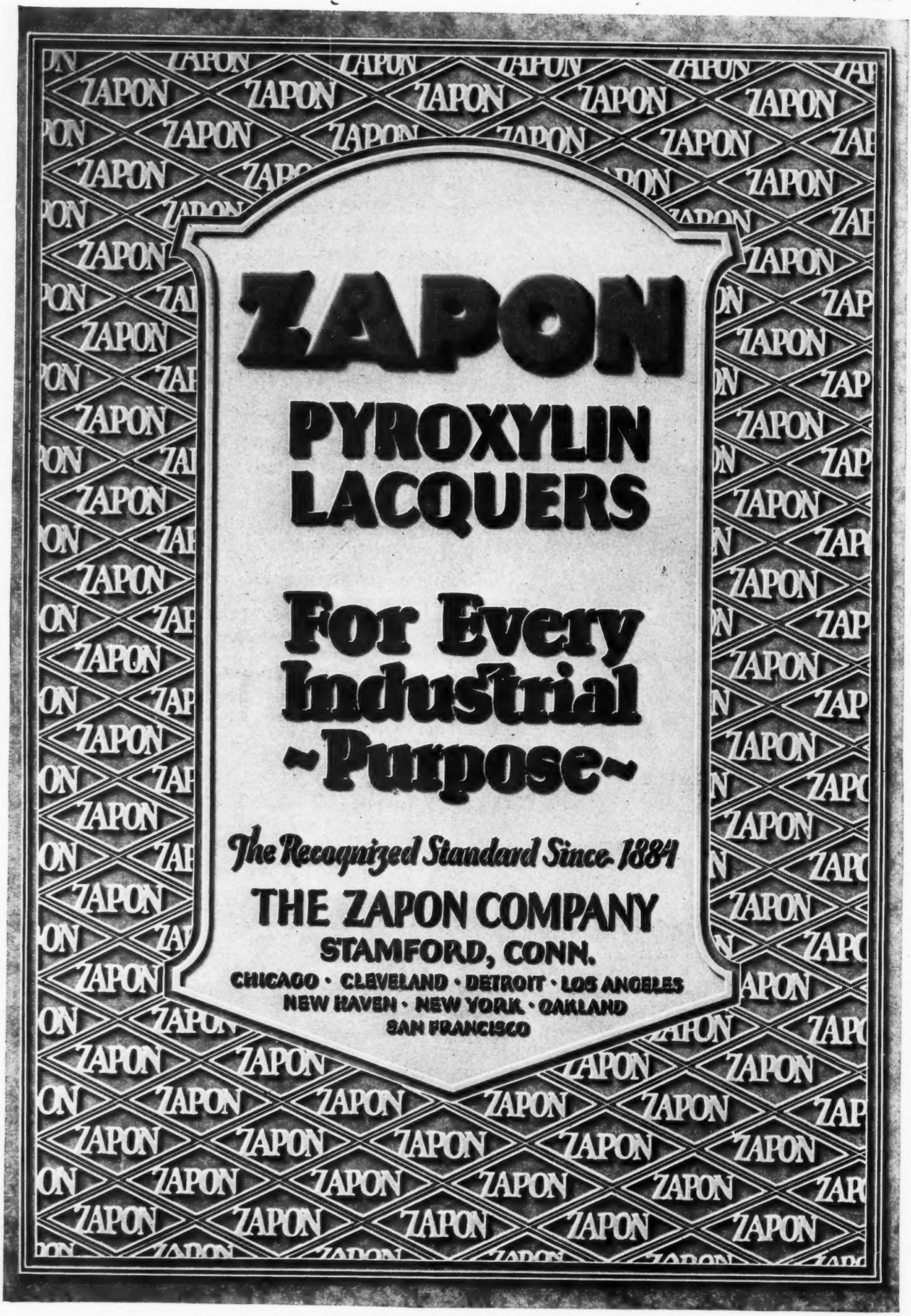
HANNUM STEERING

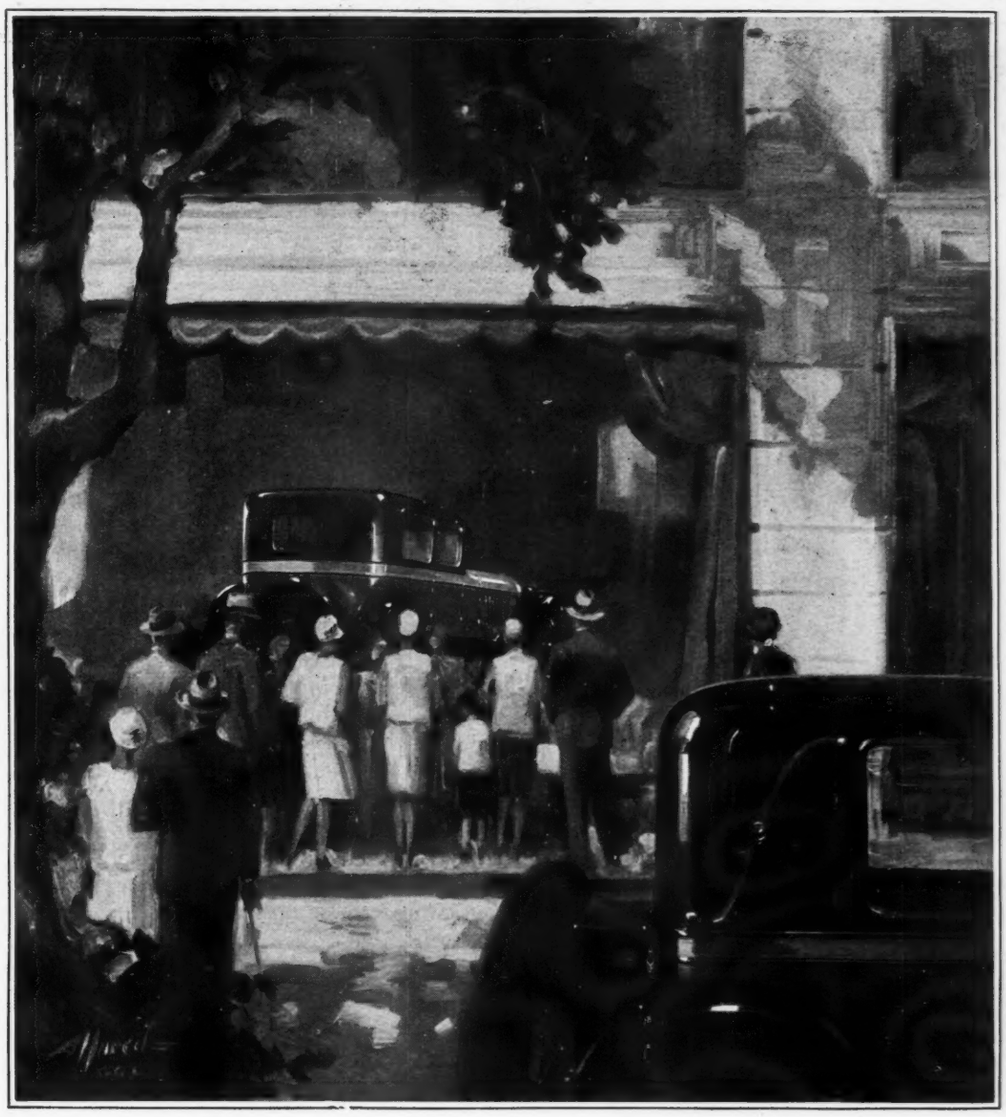
The Hannum variable leverage principle, in its most advanced and refined form, accomplishes what heretofore has been done almost entirely by physical exertion. At sharper steering angles the leverage on the pitman progressively increases. Pulling into the traffic is done with the minimum of effort. The best driver's ability is magnified, his strength is conserved, and the chances for errors of judgment are reduced.

Once under way, however, there is no lost motion, for then Hannum leverage *shortens*. The front wheels become instantly responsive.

Thus Hannum Steering meets every traffic need with higher factors of safety, speed and comfort. Prove it. Full co-operation and data are available for any desired tests.

HANNUM MANUFACTURING COMPANY
Milwaukee


ZAPON
PYROXYLIN
LACQUERS
For Every
Industrial
~Purpose~
The Recognized Standard Since 1884
THE ZAPON COMPANY
STAMFORD, CONN.
CHICAGO · CLEVELAND · DETROIT · LOS ANGELES
NEW HAVEN · NEW YORK · OAKLAND
SAN FRANCISCO



Through the Windows of Display Rooms the Exterior is all they can see

Design . . . color . . . finish. These in a motor car are important to the casual observer as he stops for a moment at the display window. The first impression made by the Arcozon-finished motor car is one of rich, appealing color. Then comes a realization of its unusually soft, gleaming lustre.

But time brings a greater discovery . . . that severe weather conditions, beating sun or gritty dust do not affect its silken, velvety surface. Adhesive, elastic and extremely durable Arcozon represents the highest development of a pyroxylin lacquer. It flows on smoothly . . . dries quickly and requires but little rubbing to bring out the full richness of its soft glow.

May we send a man from our technical department to explain the Arcozon lacquer system? What date will be convenient for you? (86)

THE ARCO COMPANY, CLEVELAND, OHIO

PAINTS • VARNISHES • ENAMELS • LACQUERS

THE ARCO PYROXYLIN ARCOZON LACQUER SYSTEM

Motors on Timkens

The most vital specification you can make on any order for electric motors is "Timken Bearings." That specifies not alone the lubricating economy of anti-friction bearings, but the supreme endurance made possible only by Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS*, and Timken-made electric steel.

In this exclusive Timken combination there is high speed capacity, extra load area, full thrust and shock capacity, greater rigidity, compactness, and simplicity.

Forget burnouts and shutdowns entirely! Get rid of dripping and fire hazards. Wipe out all the cost of bearing replacement, and almost all routine maintenance. Improve every phase of operation.

Specify Timken Tapered Roller Bearings in all the motors you buy.

THE TIMKEN ROLLER BEARING CO.
C A N T O N , O H I O

TIMKEN *Tapered Roller* **BEARINGS**

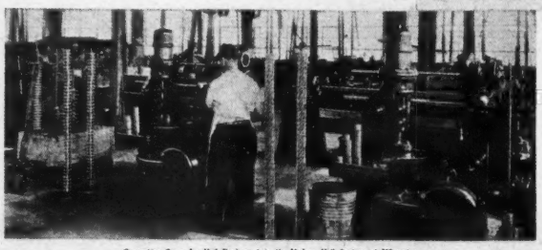
DOUBLE ROW SELF-CONTAINED TIMKEN BEARING

SINGLE ROW TIMKEN BEARING

Harrison
again leads
1927 totals show
Harrison-cooled
cars in the
majority

HARRISON
RADIATORS

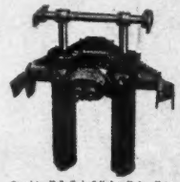
Automotive Industries
November 5, 1927



Generating Gears for Heil Equipment in the Modern Heil Factory at Milwaukee.

Heil Gears Are Precision Made

KNOWING the importance of gears as integral parts of the pumps and power take-offs for Heil Hydro Hoists, the Heil Co. builds all gears used in its equipment in the Heil factory. Five general operations are required, after the castings are made, to produce gears engineered to Heil standards. The castings are turned and bored to size. The teeth are generated on a Fellows Gear shaper and rounded when intended for power take-offs. Hardening is the next operation after which they are sand blasted and the bore ground to within .0005. A manufacturer might get by with lower standards, but this precision production is what enables Heil to offer the only truck hoist sold under an absolute written two year guarantee. Bulletin 160 explains and illustrates the Heil Hydro Hoist. Write for your copy today.



Complete Heil Twin-Cylinder Hydro Hoist made right to give years of trouble-free service.

1150-1200 Montana Ave.
MILWAUKEE, WISCONSIN

THE HEIL CO.

Manufacturers of
BODIES, HOSTS, TANKS

Typical chassis with Heil Hydro Hoist No. 12-W mounted, to lift 12 tons of dirt in 30 seconds.

Gear Pump Assembly in Heil Hydro Hoist.

Size 1½ ton FA chassis with Heil "B in 1" Combination Body and Heil Hydro Hoist No. 9-W.

We Reproduce

With Permission

An advertisement of the Heil Company, Milwaukee, Wis., manufacturers of Truck Bodies, Hoists, etc., which appeared in the November 5th issue of this publication.

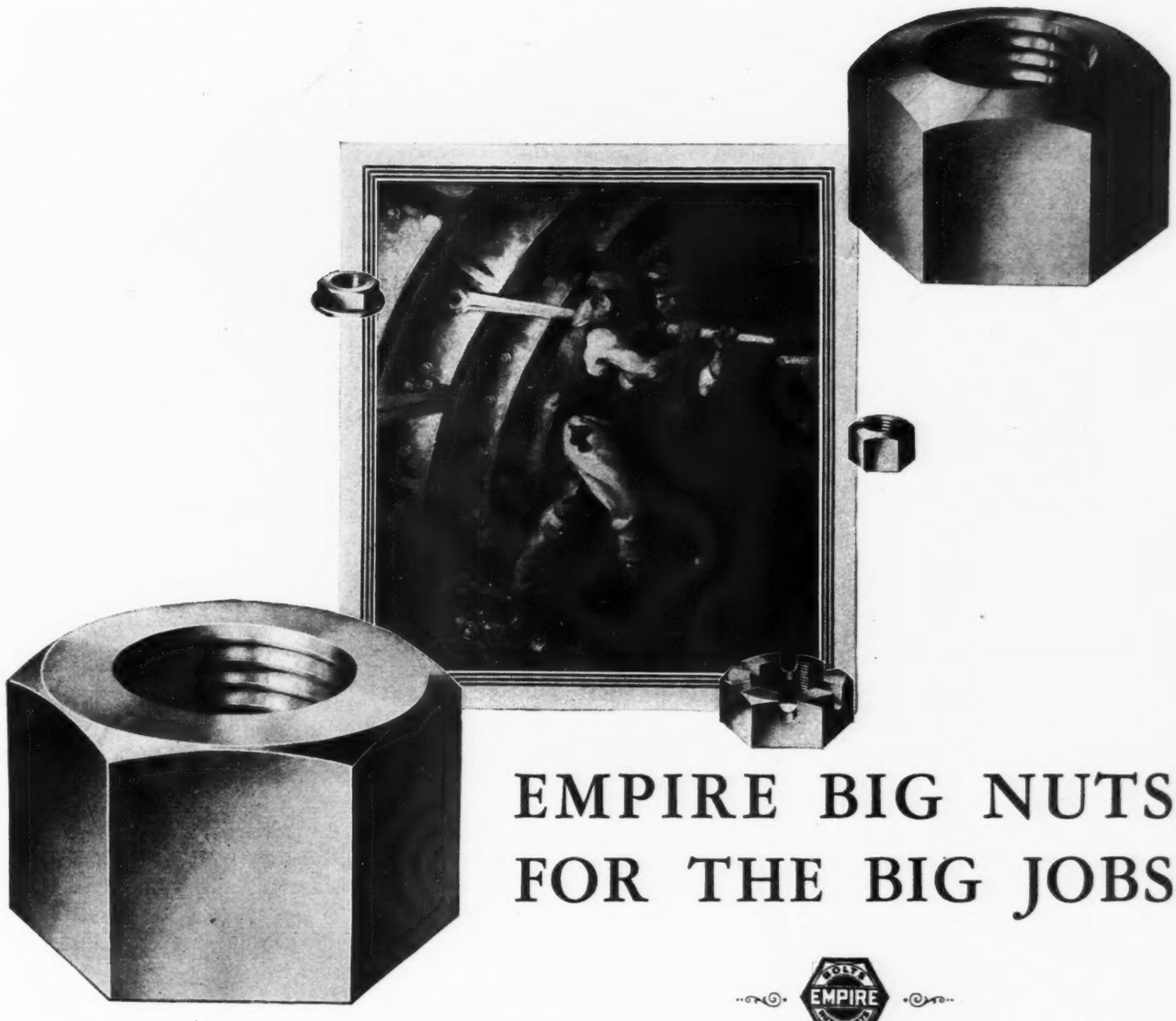
It is, of course, gratifying to have an ever increasing number of manufacturers adopting the Gear Shaper for cutting gears, and publicly advocating the advantages of this method, and we take this opportunity to thank the Heil Company.

Good gears in large quantities—a cardinal feature of the Gear Shaper.

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Works: 78 River St., Springfield, Vt., U. S. A.

Branch Office: 651 Book Bldg., Detroit, Michigan



EMPIRE BIG NUTS FOR THE BIG JOBS

A BIG NUT is not merely a small size nut raised to larger proportions. It must be made particularly for the very definite job it has to perform. Empire nuts in the larger sizes, although produced in quantities, are made as carefully as though each were an individual piece of machining. They are flawless, free from burrs or scale and the threads are as accurate as the threads of the gauge that measures them.

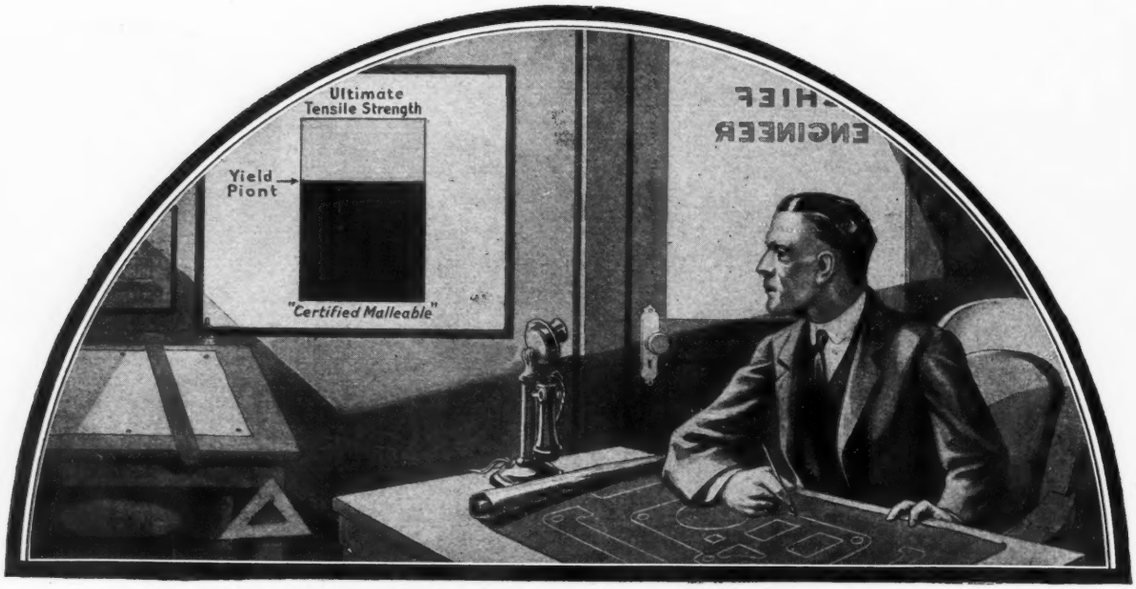
Let us quote on your requirements

RUSSELL, BURDSALL & WARD BOLT & NUT COMPANY
PORT CHESTER, N.Y.

Branch Office: Straus Building CHICAGO — Branch Office: General Motors Bldg. DETROIT — Branch Factory: ROCK FALLS, Ills. — Straight & Gilbert 169 Jackson Street SEATTLE — Maxwell & Hartzell, Inc. 728-736 Eleventh Street SAN FRANCISCO

Makers of Bolts, Nuts and Rivets Since 1845

EMPIRE BOLTS & NUTS



The high yield point of Certified Malleable Iron makes it invaluable to the engineer designer.

Certificate Holders During Quarter Ending Sept. 30, 1927

Albany Malleable Iron Co.	Voorheesville, N. Y.
Albion Malleable Iron Co.	Albion, Mich.
American Chain Co.	Bridgeport, Conn.
American Malleable Castings Co.	Marion, O.
American Malleables Co.	Owosso, Mich.
Badger Malleable & Mfg. Co.	South Milwaukee, Wis.
Baltimore Malleable Iron & Steel Castings Co.	Baltimore, Md.
Belle City Malleable Iron Co.	Racine, Wis.
Chain Belt Co.	Milwaukee, Wis.
Chicago Malleable Castings Co.	West Pullman, Chicago, Ill.
Columbia Malleable Castings Co.	Columbia, Pa.
Columbus Malleable Iron Co., The	Columbus, O.
Danville Malleable Iron Co.	Danville, Ill.
Dayton Malleable Iron Co., The	Dayton, O., Ironton, O.
Decatur Malleable Iron Co.	Decatur, Ill.
Eastern Malleable Iron Co., The—Works, Naugatuck, Conn.; Bridgeport Malleable Iron Works, Bridgeport, Conn.; Troy Malleable Iron Works, Troy, N. Y.; Wilmington Malleable Iron Works, Wilmington, Del.; Vulcan Iron Works, New Britain, Conn.	Naugatuck Malleable Iron
Erie Malleable Iron Co.	Erie, Pa.
Federal Malleable Co.	West Allis, Wis.
Frazer & Jones Co.	Syracuse, N. Y.
General Electric Co.	Erie, Pa.
Glancy Malleable Corporation	Waukesha, Wis.
Illinois Malleable Iron Co.	Chicago, Ill.
Iowa Malleable Iron Co.	Fairfield, Ia.
Jamestown Malleable Products Corp.	Jamestown, N. Y.
Kalamazoo Malleable Iron Co.	Kalamazoo, Mich.
Laconia Car Co.	Laconia, N. H.
Lancaster Foundry Co.	Lancaster, Pa.
Lakeside Malleable Castings Co.	Racine, Wis.
Link-Belt Co.	Indianapolis, Ind.
Marion Malleable Iron Works	Marion, Ind.
Meeker Foundry Co.	Newark, N. J.
Moline Malleable Iron Co.	St. Charles, Ill.
National Malleable & Steel Castings Co.	Cleveland, O., Chicago, Ill., Indianapolis, Ind., Toledo, O., E. St. Louis, Ill.
Northern Malleable Iron Co.	St. Paul, Minn.
Northwestern Malleable Iron Co.	Milwaukee, Wis.
Peoria Malleable Castings Co.	Peoria, Ill.
Pittsburgh Malleable Iron Co.	Pittsburgh, Pa.
Rhode Island Malleable Iron Works	Hillsgrove, R. I.
Rockford Malleable Iron Works	Rockford, Ill.
Ross-Meehan Foundries, The	Chattanooga, Tenn.
St. Louis Malleable Casting Co.	St. Louis, Mo.
Superior Steel & Malleable Castings Co.	Benton Harbor, Mich.
Symington Co., The	Rochester, N. Y.
Temple Malleable Iron & Steel Co.	Temple, Pa.
Trenton Malleable Iron Co., The	Trenton, N. J.
Union Malleable Iron Co., The	E. Moline, Ill.
Vermilion Malleable Iron Co.	Hoopeston, Ill.
Warren Tool & Forge Co.	Warren, O.
Webster Mfg. Co., The	Chicago, Ill.
York Mfg. Co.	York, Pa.
Zanesville Malleable Co.	Zanesville, O

High Yield Point Means Useful Strength

Certified Malleable Iron illustrates the importance of considering yield point rather than ultimate strength alone when specifying material. After all, it is useful strength of material that we must consider and pay for in designing machines or parts, and this is the strength that lies below the yield point.

Yield Point 65% of Ultimate Strength

The yield point of Certified Malleable averages about 65% of its ultimate strength. Thus Certified Malleables with a minimum ultimate strength of 50,000 pounds per square inch (A.S.T.M. Specifications) regularly exceed 30,000 pounds per square inch in yield point.

Certified Malleables are uniform in structure and quality. They regularly exceed the standard minimum specifications of 50,000 pounds tensile strength and 30,000 pounds yield point, thus assuring a uniformly high degree of useful strength as indicated by the yield point.

MALLEABLE IRON RESEARCH INSTITUTE, INC.
UNION TRUST BUILDING CLEVELAND, OHIO

POSITIVE · PHYSICAL · PROPERTIES · INCORPORATED · TRADE MARK

CERTIFIED-MALLEABLE IRON

Every Forming a Perfect Specimen

IN most of the large automobile body plants, Agathon Special Finish Sheets have a crew of keen admirers. These are the inspectors of formed sheets. Due to the unusually uniform texture of Agathon Sheets, they withstand the most severe forming operations.

And in the finishing department, too, Agathon Sheets find a warm welcome. For the clean, smooth, unvarying surface of these sheets takes a finish that is a credit to the automobile manufacturer.

If you have never used Agathon Special Finish Sheets, give them a trial. Then you'll always use them.

Central Alloy Steel Corporation, Massillon, Ohio

World's Largest and Most Highly Specialized Alloy Steel Producers

Makers of Agathon Alloy Steels

Cleveland				St. Louis
Syracuse	Detroit	Chicago	New York	Cincinnati
San Francisco	Philadelphia	Los Angeles	Tulsa	Seattle

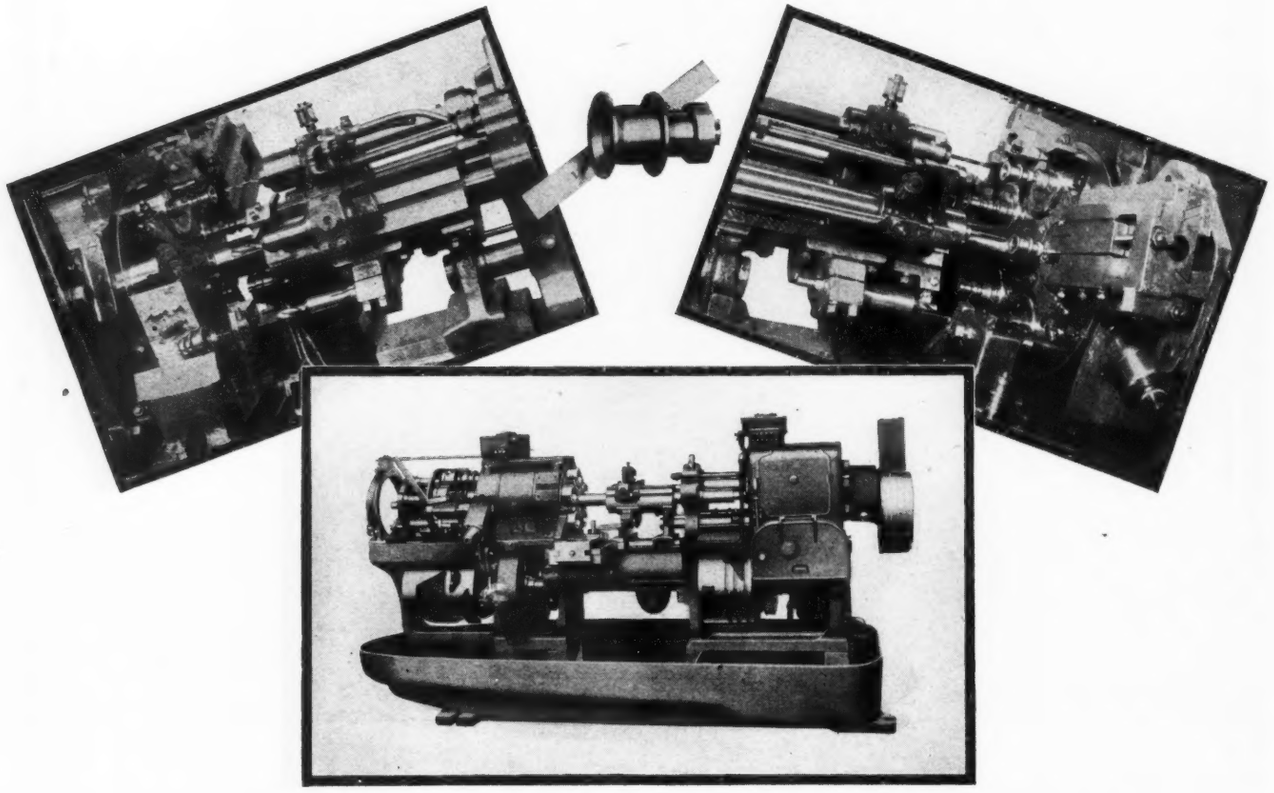
AGATHON STEELS

Use Agathon Sheet Steel for

Automobile Bodies
Cowls
Hoods
Crown Fenders
Metal Furniture
Metal Doors and Window Casings
Railroad Car Interiors, Etc.

AGATHON SHEET STEEL

Speed!



5-Spindle Acmes Are *Fast*— They Are Also *Dependable*

Speed **and** ***Dependability*** **are prime necessities today in successful machinery—whether it be automobiles or the production machine tools by means of which automobiles and all other machines are built.**

5-Spindle Acmes are ***Fast*** **and** ***Dependable*** **because they are scientifically designed and carefully built. Not only this, but they have been given long and rigorous working tests by which the design and construction has been checked upon and through which they have been refined.**

There was a time when there was considerable difference of opinion about the practicability of Multiple Spindle Automatics and about their capabilities. While it is safe to say that in the minds of production men the questions have long since been settled in favor of Multiples—it is not as certain that all production men realize how ***Fast*** **and how** ***Dependable*** **modern Multiples have become.**

A demonstration of the latest 5-Spindle Acmes on your work will open your eyes to the ***Speed,*** **the** ***Accuracy*** **and the** ***Low Cost*** **with which these** ***Dependable*** **Multiples will turn out your toughest jobs. A study of the 5-Spindle Acmes will reveal to you a surprising number of engineering refinements—each one of which contributes something toward Speed, Accuracy and Dependability.**

5-Spindle Acmes are built in three sizes—9/16 in., 1 in., and 1⅝ in. Belt Driven or Motorized

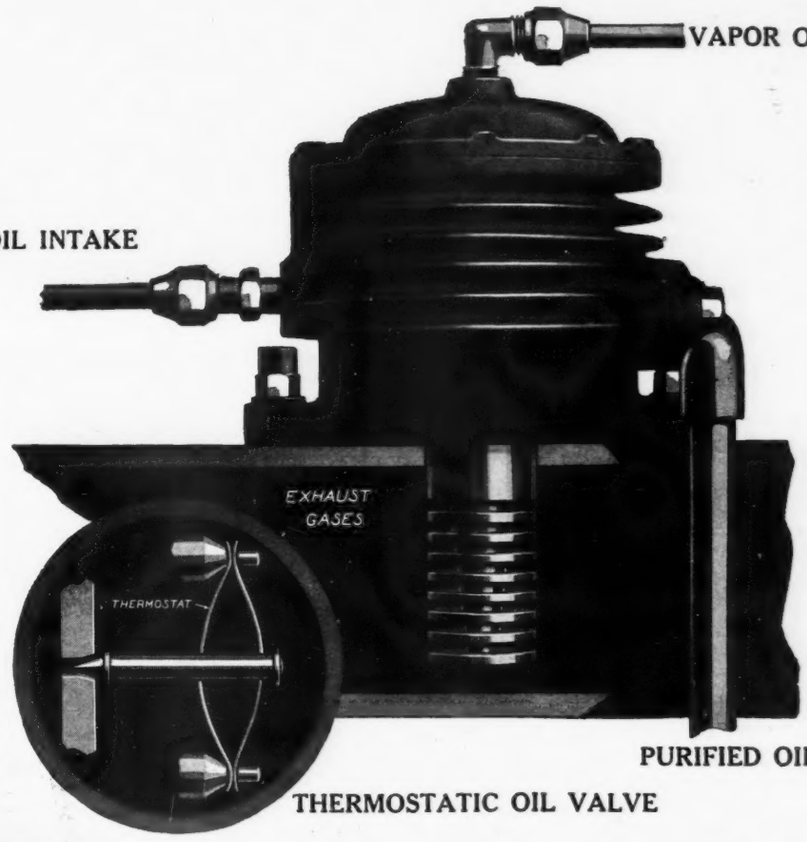
The National Acme Company

Cleveland, Ohio **Windsor, Vt.**

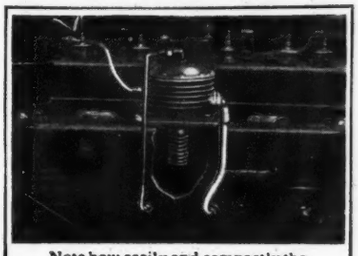
New York **Detroit** **Chicago**

Makers of Acme and Gridley Multiple Spindle Automatics, Gridley Single Spindle Automatics and Gridley Multiple Spindle Chucking Machines at Windsor, Vermont, and Namco Opening Dies, Collapsing Taps, Screw Machine Products and "Positive" Centrifugal Oil Separators and Clarifiers at Cleveland, Ohio.

Announcing the New SKINNER OIL RECTIFIER



In operation, diluted oil is fed into a heating chamber, refined by heat from a conduction plug extending into the exhaust manifold, and returned to the crankcase by gravity. The vapors, distilled off in the process, pass into the intake manifold. The Thermostatic Oil Valve which controls the flow of diluted oil entering the device automatically maintains the oil at the proper refining temperature.



Note how easily and compactly the Skinner Oil Rectifier is installed.

AFTER several years of research, experiment and test we have perfected the new Model C Skinner Oil Rectifier, which effectively controls oil dilution while taking the contaminated oil directly from the crankcase. Easily installed on the exhaust manifold, the new Skinner Rectifier is particularly well adapted to poppet valve engines.

Easy installation, either in production or on cars in use, is but one of the many advantages of the new Skinner Oil Rectifier. It insures longer motor life and improved performance—reduces maintenance expense and increases oil mileage. Simple in design and with only one moving part it provides an efficient oil refining service, in all climates and at all temperatures.

The Model C Skinner Oil Rectifier is now available for several of the popular makes of cars. Write today for complete information.

SKINNER AUTOMOTIVE DEVICE CO., INC.
2223 DALZELLE, COR. OF 14th • DETROIT, MICH., U. S. A.

European Representatives: Gaston E. Marbaix, Ltd., Adelaide House, King William St., London, Eng.

Manufacturers of the Skinner Oil Rectifying System, standard equipment on all Willys-Knight and Falcon-Knight cars.

SKINNER OIL RECTIFIER

Pick 'em up—move 'em—spot 'em—get back for another load—FASTER with the Curtis air hoist!

One more example from among the scores available! The Spencer Trailer Co. says: "Before we installed the Curtis air hoist, trailers were loaded on motor trucks by hand and hauled to the shipping dock. This took three men, and we now find that one man can do the work at least 25% faster than three were doing it the old way."

They save costly man-hours and also keep an important "bottle neck" open. In every plant there are spots where, if traffic congestion were permitted, it would slow up work at many other points. Nothing will keep these bottle-necks free of congestion like a speedy, economical Curtis air hoist!

This may be mounted in fixed position, or on a crane or trolley; it may be vertical, horizontal or any other position. It is one of the most *adaptable* types of lift and, though it costs scarcely more than a hand chain block, it is 13 times faster, and is unmatched by *any* other power lift for accuracy of spotting, freedom from servicing and day-in and day-out reliability.

Curtis engineers have assisted in working out many special applications, and will gladly do the same for you. Catalog on request.

Air Hoists, Cranes, Trolleys. Fast, economical, speed up production.
Paint Spray Compressor. Hand unloader. (By-pass for starting.)
Model "A" Air Compressors. Full self-oiling. Water cooled. Up to 50 H.P.
Portable Compressor, both operated and moved by Fordson.
Style "V" Two Stage Compressor. Air-Cooled. ¾ to 2 H.P.
Automatic Air Mist Car Wash System. A complete cleaning service.
Hydraulic Car Washer. 1 H.P.; 2 H.P.; 2 H.P. oversize.
Rotating Auto Lift. Oil-locked. Absolute control and safety.
Air Lift. For raising one end of car. Excellent for washing underside.

Check items in which interested, write name and address in margin and mail.

Curtis

Pneumatic Machinery Company

St. Louis

74th Year

1917 Kienlen Ave., St. Louis

518-D Hudson Terminal, N. Y.

C4

Take a Tip From Nature

IN nature's handiwork when she wants *lightness* and *strength*, she employs the tubular shape. Consider the bamboo, the wheat stock, bones of animals and other instances where nature meets the need of strength with a minimum of weight. In automotive construction the demand is for less weight, the saving of materials wherever possible, but at no sacrifice of strength. In the case of many automotive parts this is best accomplished by the use of seamless steel tubes.

Pittsburgh Seamless is enabling many automobile and automotive parts manufacturers to reduce weight without sacrifice of strength, or to obtain greater strength with the same weight, compared with welded tubing or other steel shapes. In fact, practically every American made car uses Pittsburgh Seamless tubing in some part of its construction.

The consistent high quality and uniformity maintained in Pittsburgh Seamless tubing is due in no small measure to the fact that we are seamless specialists, with an organization of engineers and workmen whose entire activities are devoted to the production of quality seamless steel tubes exclusively.

We are thoroughly equipped to make regular or special tubing of almost any description. We do upsetting, swaging, tapering and other forming operations. Almost any difficult shape can be formed with "seamless." No doubt you can make a greater use of seamless steel tubes advantageously. We will gladly give you the benefit of our engineering knowledge of tubing.

Pittsburgh Steel Products Co.

DIVISION OF

Pittsburgh Steel Co.

Pittsburgh **Detroit**
New York **Houston**
Chicago **Tulsa**

Pittsburgh Seamless Tubing gives desirable advantages in weight, strength, design and manufacturing costs in:

Propeller Shafts — Torque Tubes
Steering Columns — Wrist Pins
Brake Rocker Shafts — Bearing Races
Frame Cross Members
Drag Links — Axle Housing Sleeves
Valve Rocker Shafts — Tie Rods

Write for our new data booklet "Seamless Mechanical Tubing."

Pittsburgh Seamless

Lightness ***Strength*** ***Economy*** ***Safety***

Why not melt some of your "Frozen" capital?

You strive to keep your capital liquid. Then why "freeze-up" more than is necessary in plant, equipment and inventory for the making of parts which you can buy at lower prices than your own production costs?

Down here in Louisville we are turning out wood body parts at prices which effect real savings for the automobile industry. This is why important manufacturers are depending more and more upon us.

We can make these parts to your exact specifications. Each part is completely machined for quick and economical assembly. No further machining is necessary. Being relieved of the necessity of storing and machining the lumber in your own plant, you can devote your entire floor space to assembly—*you can produce the maximum number of bodies per dollar invested in your body building equipment.*

Our two automotive plants, designed especially for the production of wood body parts, have a combined capacity of 5,000,000 feet per month, assuring our customers of a steady and dependable supply. Carefully planned production methods and exacting inspection guarantee the quality as well as the accuracy of our work.

How much can we save you?

We will be glad to submit quotations on any of your wood body parts—also floor boards, running boards, seat frames, etc. Send us your specifications.

THE MENGEL CO. INC.

AUTOMOTIVE DIVISION, LOUISVILLE, KY.

Mengel wood work saves money and worry

Another New "Norton"—
An Hydraulic Surface Grinding Machine

for production grinding of small parts or for general tool room use — a simple, accurate, productive machine.

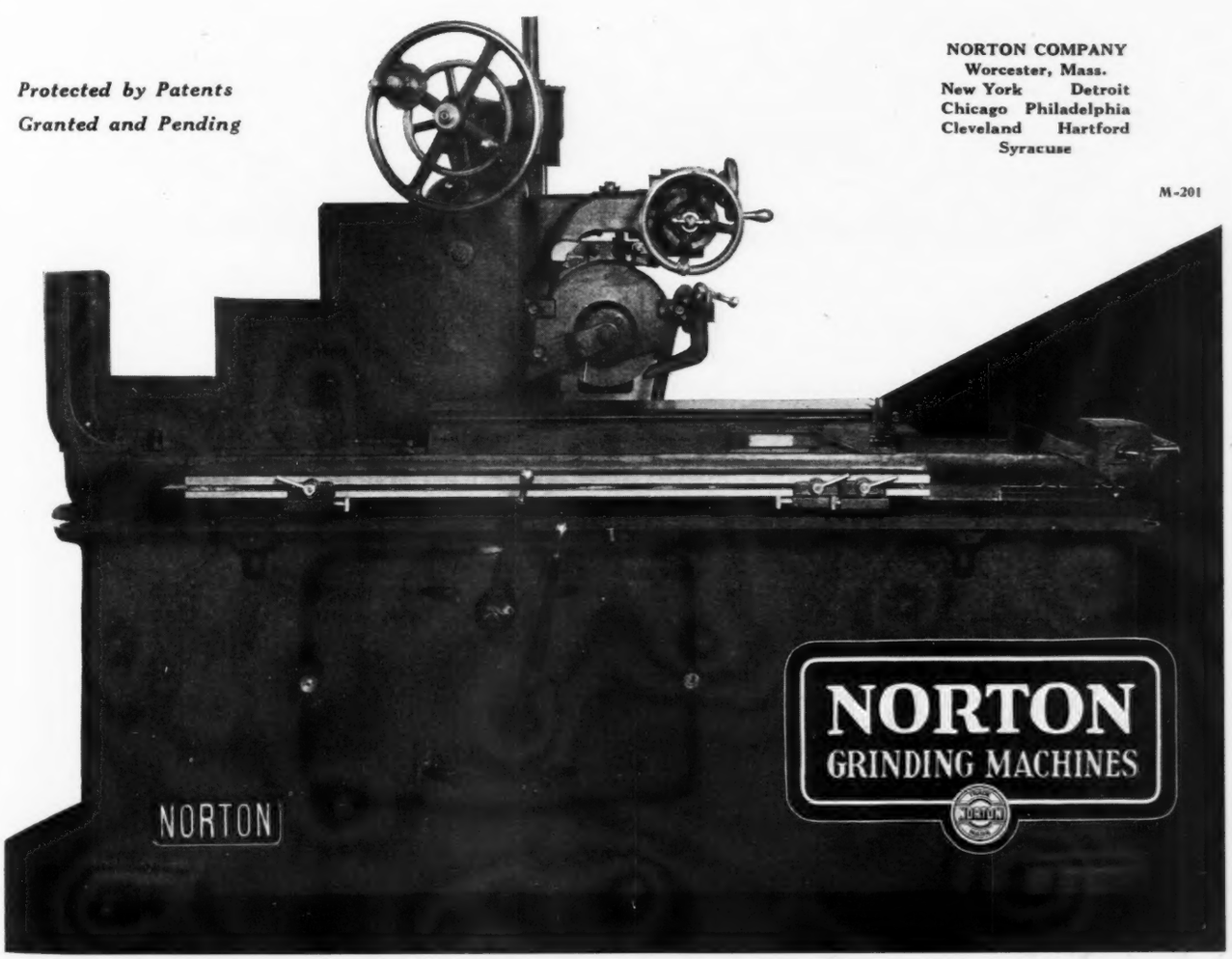
Two Sizes:

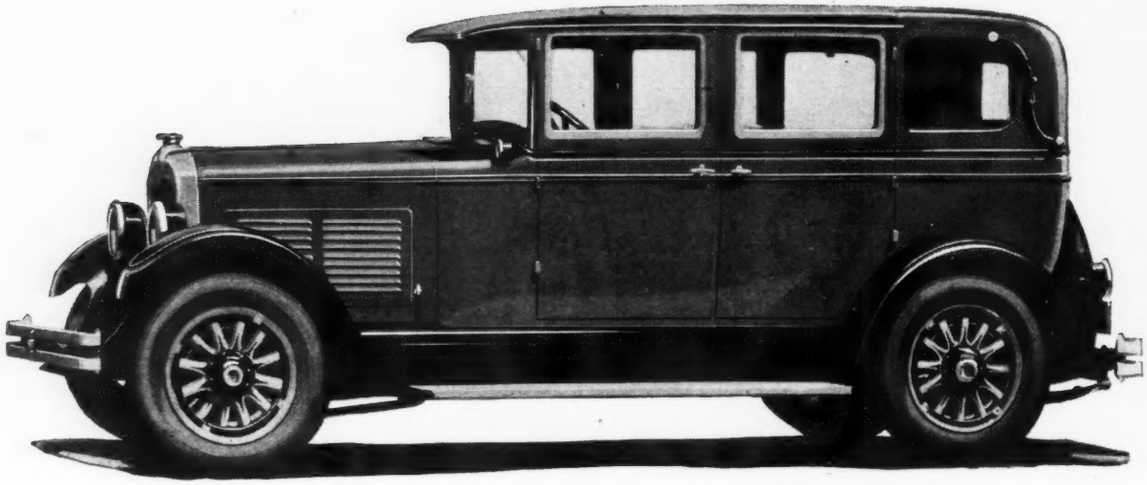
6″ x 10″ x 36″
6″ x 10″ x 48″

Protected by Patents Granted and Pending

NORTON COMPANY
Worcester, Mass.
New York Detroit
Chicago Philadelphia
Cleveland Hartford
Syracuse

M-201





REO WOLVERINE

The coming of the Reo Wolverine Sedan signalized yet another triumph for this sensational successful Reo series.

And Hayes Body Corporation has been privileged to produce yet another body worthy of performance standards which have taken the country by storm.

The HAYES BODY *Corporation*

NEW YORK SHOW
Third Floor
Booths C-25 & C-26

CHICAGO SHOW
South Hall
Booths 179 to 185

GRAND RAPIDS, MICHIGAN

THREAD WELL
TRADE MARK REG.

Unretouched portrait of a special Threadwell Tap for automotive work

Threadwell
—an imprint that assures better threads

"Threadwell" is the name to look for on taps and dies—it is a name that carries a meaning easily understood by the average mechanic — a name that has great significance for the quick thinking purchasing agents of large corporations.

Tools which bear the imprint of the name "Threadwell" have stimulated and held the confidence of users solely by the way they work in the shop — producing accurate threads that reduce the cost of assembling.

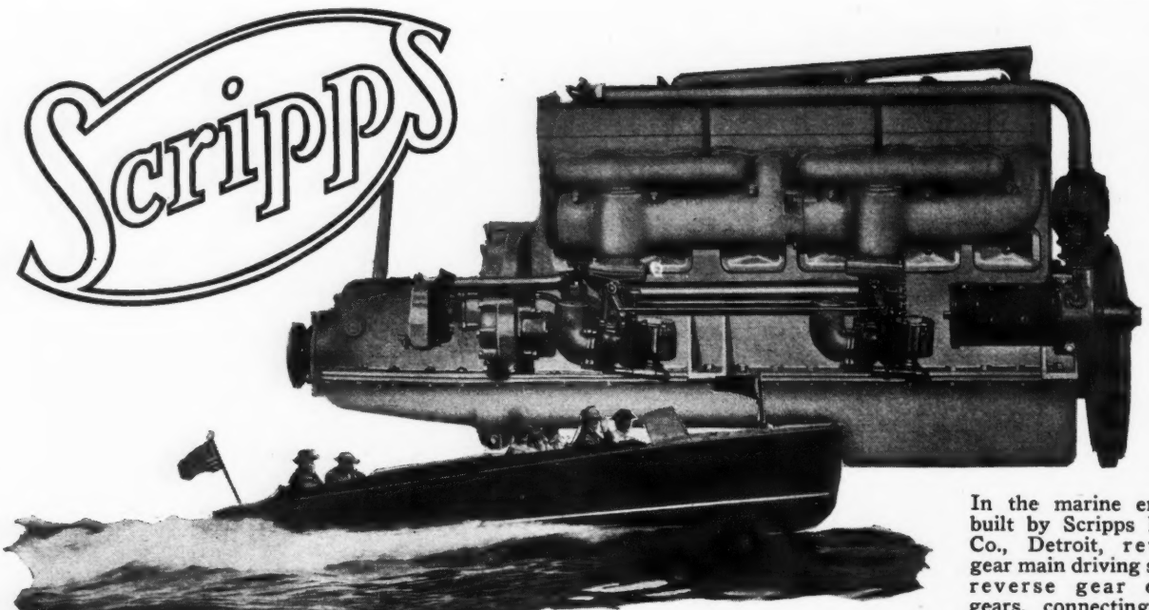
There are many reasons why Threadwell Taps have established a reputation for economy. Let us tell you, in detail, what some of the largest automobile manufacturers have discovered concerning the economy of Threadwell Taps.

THE THREADWELL TOOL COMPANY, GREENFIELD, MASS.

1323 Dime Bank Bldg.....Detroit, Mich.
158 Chambers Street.....New York, N. Y.
2219 Maplewood Avenue.....Richmond, Va.
18 So. Clinton Street.....Chicago, Ill.
610 Michigan Street.....Milwaukee, Wisc.
604 Mission Street .....San Francisco, Cal.
2204 Packard Bldg.....Philadelphia, Pa.
Pioneer Building.....Seattle, Wash.
86 Hazeltine Avenue, Kenmore (Buffalo) N. Y.
1012 Elm Street.....Cincinnati, Ohio
320 N. Grand Blvd.....St. Louis, Mo.
418 Bd. of Trade Bldg.....Indianapolis, Ind.
2138 Oliver Building.....Pittsburgh, Pa.

Agents for the British Empire, Coats Machine Tool Co., London, England

TAPS—DIES—SCREW PLATES AND SMALL TOOLS



In the marine engines built by Scripps Motor Co., Detroit, reverse gear main driving shafts, reverse gear engine gears, connecting rods and piston pins are made of Vanadium Steel.

For The Hard Grind Of Marine Service

Scripps Specifies Vanadium Steel

MARINE service is most exacting on an engine. It requires almost constant maximum load and power output.

Naturally, marine engine designers are critical of material specifications. They choose steels that can be depended upon to stand the hard-going grind, that possess the very essential strength, toughness and durability.

In Scripps Marine Engines, reverse gear main driving shafts and reverse gear engine gears (parts which are under continuous load while the engine is in operation) are made of Vanadium Steel. Connecting rods and piston pins—also subjected to severe stresses—are made of Vanadium Steel.

Better steels in vital parts better any product. Furthermore, they safeguard the manufacturer's reputation. Are you interested in steels that are higher in strength, toughness and durability? Our Metallurgists will gladly cooperate with you.

VANADIUM CORPORATION OF AMERICA

CHICAGO	NEW YORK	DETROIT
Straus Bldg.	120 Broadway	Book Bldg.

Plants at Bridgeville, Pa., and Niagara Falls, N. Y.
Research and Development Laboratories at Bridgeville, Pa.

VANADIUM STEELS

for strength, toughness and durability

CHROME MO-LYB-DEN-UM STEEL ∞ STAINLESS STEEL ∞ BRASS ∞ BRONZE

The year 1927 has brought to us a larger number of users of Strom Balls — — resulting in an increase in production of over 100%.

This fact emphasizes the confidence that the trade places in a manufacturer of quality products.

(Note: Balls are our exclusive product)

STROM STEEL BALL CO.

"The largest independent and exclusive steel ball manufacturer"

360 No. Michigan Ave. (Plant at Cicero, Ill., a suburb of Chicago) **Chicago, Ill.**

STROM BALLS ARE MANUFACTURED FROM METALS DEVELOPED BY US AND MADE TO OUR OWN SPECIAL ANALYSES. UNIFORMLY HARDENED AND HELD ACCURATE TO SIZE TO WITHIN, PLUS TO MINUS .00005 AND SPHERICITY TO WITHIN .000025. ALL STROM BALLS THUS RENDER UNIFORMLY SATISFACTORY SERVICE. STEEL BALLS, IN VARIOUS GRADES, FROM 1/16" to 4½". BRASS AND BRONZE FROM ⅛" TO 3½".

WISCONSIN AXLES

WISCONSIN PARTS COMPANY, manufacturers of Wisconsin Double Reduction Drive and Worm Drive Axles, is completing its most successful year; a year marked by a large increase in volume of axles produced and by a gratifying increase in the number of truck manufacturers using its products. Wisconsin Axles are identified with more than fifty makes of trucks and buses.

Wisconsin Parts Company produced more Double Reduction Axles than any other axle manufacturer. It is the second largest manufacturer of Worm Drive Axles. In addition, it has developed and built many special designs for government service, railroads and street railways.

For more than a decade Wisconsin Axles have occupied a prominent position in the automotive industry. The substantial growth and permanence of the company is the result of maintaining a high standard of quality, a readiness to meet new conditions in motor transportation and a policy which places the customers' interests above other considerations.

Wisconsin Axles have never been advertised in expensive national advertising mediums. Rather it has been the policy of the company to give its customers the benefit of savings, thus effected, through lower prices and better axles.

SHOW HEADQUARTERS: *New York:* Hotel Belmont, *Chicago:* Hotel Stevens

Wisconsin Parts Company - Oshkosh, Wis.

Export Department: 44 Whitehall St., New York City

SPRING MAKERS FOR THREE GENERATIONS

EST. 1857 "BARNES-MADE" PRODUCTS

Close Kin

ALL FINISHED READY FOR SERVICE

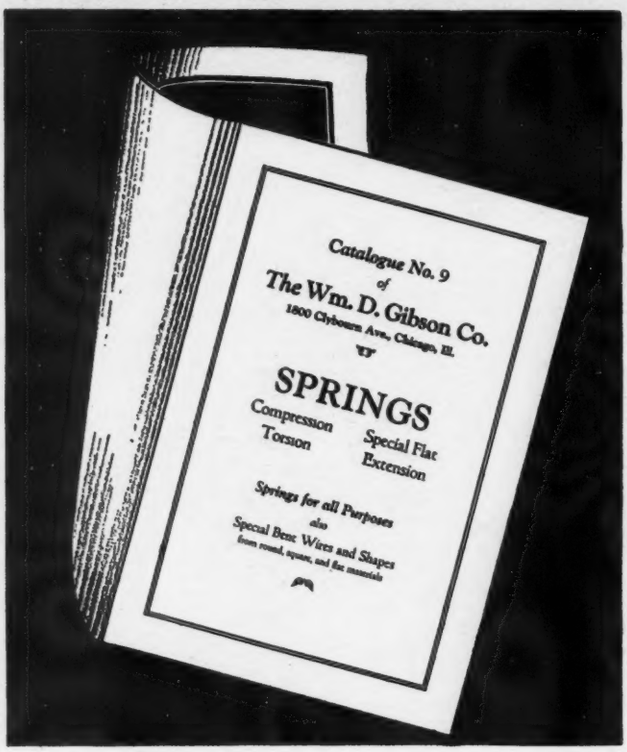
to Barnes-made Springs. All produced under the same roof and with the same painstaking care that has made the reputation for quality for Barnes-made Springs.

Ask for Catalog or better yet send your inquiry:

The WALLACE BARNES COMPANY
BRISTOL, CONNECTICUT, U.S.A.

Barnes-made Springs

SPRINGS
STAMPINGS
ASSEMBLIES
SPRING WASHERS
SCREW MACHINE PARTS
COLD ROLLED SPRING STEEL



your copy is ready

If you do not have on file or use regularly
our Catalogue No. 9
you have passed by one of the
best sources of information on

SPRINGS

(their uses, design, and manufacture)

A limited quantity of this edition is
yet available for those returning the
following coupon.

I am returning this coupon to

The WM. D. GIBSON CO.
Clybourn Ave. and Willow St., Chicago, Ill.

for a copy of their Treatise No. 9 on Springs
—without obligation on my part

NAME_____

TITLE_____

FIRM_____

ADDRESS_____

2 wks

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14

Springs in a Fortnight

In these days of small inventories the ability of your source of supply to make immediate delivery is of the utmost importance

Our plant is specially designed for speedy manufacture We carry in stock many hundred tons of Spring-making materials, so that unless the required material is absolutely special, we can ordinarily ship any order within a two weeks period.

Try Raymond's Quality Quick Service for your next requirements. You'll be more than satisfied.

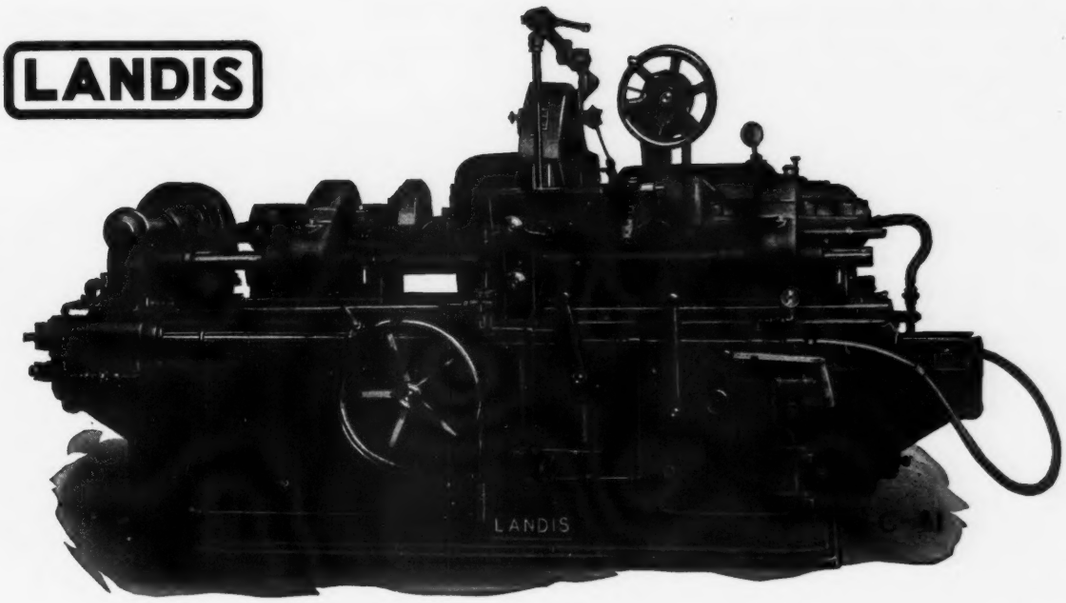
RAYMOND MFG. CO.
CORRY, PENNSYLVANIA

The convenient and prompt source of supply for any spring needed by the Automotive Industry (leaf and cushion springs excepted)

B.G.R. INC.

BARNES GIBSON RAYMOND INC.
6400 Miller Avenue
Detroit, Mich.

LANDIS



SPACING AND INDEXING

THE LANDIS Hydraulic Crank Pin Grinder will grind all pins without removing the crank shaft from the machine. In order to accomplish this an extremely accurate and clever method of indexing from one pair of pins to another pair is used.

Then too, a spacing device makes it possible to grind each pin properly spaced with relation to a predetermined line bearing.

Both of the above devices are practically "foolproof" — they may be operated easily and quickly.

LANDIS engineers have solved some exceptionally complex crankshaft grinding problems. This same service is yours — for the asking.

Grind your way to PROFIT on a LANDIS hydraulic

LANDIS TOOL COMPANY, Waynesboro, Pa.

Chicago Office: 618 W. Washington Blvd. New York Office: 2907 Singer Bldg. Detroit Office: 5928 Second Blvd.

NITRO-VALSPAR

Jewel Colors

in Brand New Harmonies . . .

READY for the Show—a new and a choicer array of sparkling Nitro-Valspar Jewel Colors in combinations surpassing those which have created so much favorable comment during the past year. These smart new color effects will add beauty and charm to many of the finest cars produced in 1928.

Invitation

YOU are cordially invited to see these beautiful new color combinations in our special exhibit at the Hotel Commodore, Rooms 639 and 641, New York, January 7th to 14th.

VALENTINE & COMPANY
456 Fourth Avenue, New York, N. Y.

Pipe joint engineering — not a profession but a function★

POWER PLANT engineers are becoming more favorable in their attitude toward oxwelded headers. They realize that in the present day installations, where higher pressures and much higher temperature are the governing factors, they must find a type of joint that will eliminate all possible hazard from leaks or breaks. The oxwelded joint is now offering these desirable and necessary characteristics.

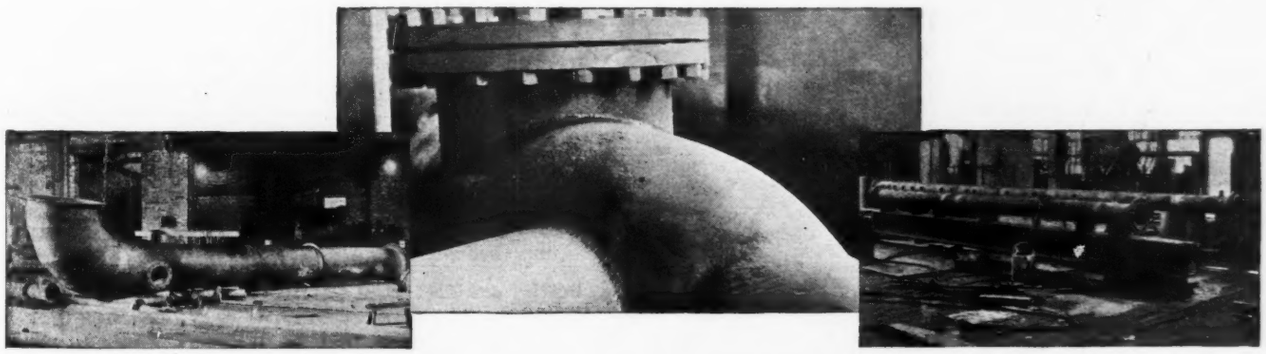
There are several obvious reasons for this. For instance, the first cost. Suppose we take as an example a ten-inch high-pressure header, thirty feet long, with six outlets varying from five to eight inches. With flanged joints and extra heavy cast steel fittings, such a header will cost approximately three times as much as a header having welded joints, welded outlets and a welded drip.

The maintenance of a joint is of still greater importance. Every engineer knows that flanged piping systems must be constantly tightened, that gaskets invariably develop leaks, and that expensive hand-moulded insulation must be replaced. The welded joint does not leak and requires no maintenance.

We have an interesting service report from an engineer in whose plant an oxwelded steam line has connected two main buildings for many years, who did not know that the line had oxwelded joints. It was installed sixteen years ago, before he took charge of the power plant, and in the intervening time has required no maintenance.

Since welded headers are proving so satisfactory, it is only logical that welded joints should be adopted throughout the entire power plant. Detailed information on the use of the oxy-acetylene process of welding and cutting in power plant piping under Linde Procedure Controls is available at Linde offices.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
General Offices: Carbide and Carbon Building
30 East 42d Street, New York
37 PLANTS . . . . . 105 WAREHOUSES



LINDE OXYGEN

★No. 12 of a series of advertisements on the engineering phases of oxy-acetylene welding and cutting. Send for the booklet entitled: "Engineering and Management Phases of Oxwelded Construction."

Studebaker COMMANDERS

set new World Records, *traveling* 25,000 miles *in less than* 23,000 minutes

Equipped with

RING TRUE BOHN BEARINGS

This marvelous record almost beyond grasp of the imagination becomes even more staggering when one begins to analyze and contemplate the stresses, strains and wear that must have been withstood by the various engine parts in its consummation.

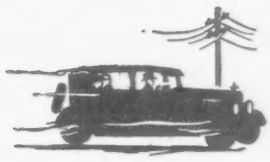
Bohn Ring True Interchangeable Bearings used by Studebaker since the time of their first introduction played a tremendously vital part in this gruelling test. For in any one of the 23,000 minutes failure of a bearing to properly function would have meant disaster.

So we share with Studebaker in their pride in this unprecedented performance.

BOHN ALUMINUM & BRASS CORPORATION
DETROIT MICHIGAN

Nelson **Bohnalite** *Pistons Give Your Car~*

Greater Speed



Pick out the cars that lead in sales during the coming year and you will find they are the automobiles that possess abundant speed. Much of this extra speed is accomplished through the use of the famous Nelson Bohnalite Piston.

Greater Power

This is also true of power. For the lighter Nelson Bohnalite Piston enables you to lighten up reciprocating parts—enables you to reduce waste—enables you to lessen friction. All of which means extra power.

Greater Pick-up

When it comes to pickup, the car equipped with Nelson Bohnalite Pistons is the peppiest thing on the boulevard! Always out in front! A newer standard in flexibility and satisfying smoothness is developed through the use of this outstanding piston.

BOHN ALUMINUM & BRASS CORPORATION Detroit, Mich.

Also makers of the famous Bohn Ring True Bearings

NELSON
BOHNALITE
PISTONS

The Light Alloy Piston With the Steel Backbohn

Heat treated for uniformity—strength and hardness.

Special Alloy Steel Backbohns are cast in, to control expansion and maintain satisfactory clearances under all engine operating conditions.

The Wholesale Yard Stick

The following facts on automotive marketing are a definite and safe guide for any concern that is distributing via wholesale channels.

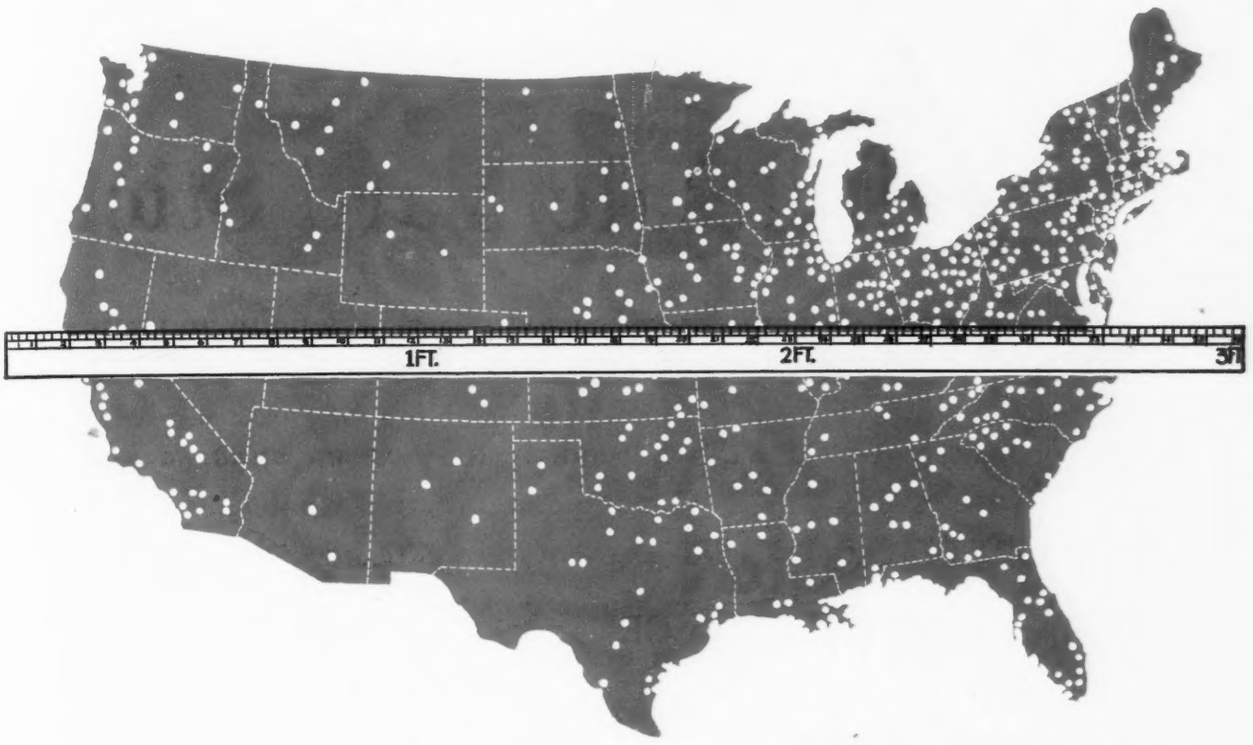
On the opposite page is a map whereon we indicate *six hundred and forty-three* First, Second and Third line automotive wholesaling centers in the United States. This presentation is the result of nation-wide surveys conducted by the Motor & Accessory Manufacturers Association and other marketing organizations—augmented by our own research investigations.

Where 60% of the manufacturers use a specific city for wholesale distribution it is considered a First line city. If 40% use a city it becomes a Second line point. If used by less than 40% of the manufacturers it falls into the Third line classification.

More intensity of merchandising method, hand-to-mouth buying, and increasing density of car population, are responsible for the ever widening scope of the wholesale market.

In a recently published 48 page book we make a complete analysis of the market, by States. It presents all wholesaling cities — gives the number of car agencies, repair shops, the populations, etc.

A copy will be forwarded, with our compliments, to any automotive manufacturer, or advertising agency account executive, who will make request.



Come to Automotive Headquarters

If you want better sales coverage — wholesale and retail — we can help you.

If you have need for market analysis, the exceptional facilities of our Research Department are at your instant disposal.

We will be glad to show how your advertising dollar will go the greatest distance in accomplishing merchandising results.

We know the industry. We know the trade. We know dealers—and how to fit them into your marketing operations.

CHILTON CLASS JOURNAL COMPANY

Publishers of Automotive Business Papers

Chestnut and 56th Sts., Philadelphia

AUTOMOBILE TRADE JOURNAL
MOTOR AGE
AUTOMOTIVE INDUSTRIES
AUTOMOTIVE INDUSTRIAL RED BOOK
MOTOR WORLD WHOLESALE
CHILTON CATALOG & DIRECTORY
COMMERCIAL CAR JOURNAL
OPERATION & MAINTENANCE

28th Annual NATIONAL

Auto Shows

NEW YORK
GRAND CENTRAL PALACE
Jan. 7-14, 1928

CHICAGO
COLISEUM
Jan. 28-Feb. 4, 1928

The Latest and Best in Cars
The Newest in Accessories

Also

A Light Truck Section
A Shop Equipment Section

The Shop Equipment Sections will be open to the trade only until 5 p. m.—except on the opening day. This will afford factory service managers, wholesale distributors, dealers and service station operators an opportunity to inspect in comfort the latest developments in service machinery and tools. In the late afternoon and evening the exhibits will be open to the public.

TRADE DAYS—The Trade Days, inaugurated three years ago, will be in force again. On Monday and Tuesday at both shows persons engaged in the trade will be admitted without charge from 10 a. m. to 1 p. m.

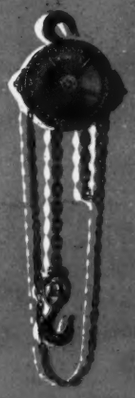
Tickets for Trade Days and Shop Equipment Sections will be supplied to all who are entitled to them, in advance and on application at the buildings.

Auspices of National Automobile Chamber of Commerce, Inc., with the cooperation of Motor and Accessory Manufacturers Association

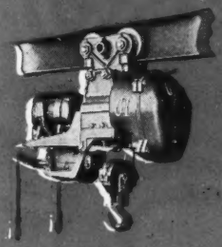
S. A. Miles, *Manager*
366 Madison Ave.
New York City

STOP WASTING MEN

Chisholm-Moore manufactures a complete line of overhead material-handling equipment. Below are a few C-M Products. The catalog describes them all. Write for it.

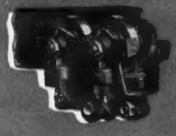


Model K Cyclone

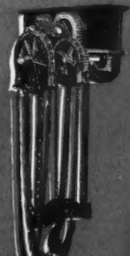


Electric Hoist

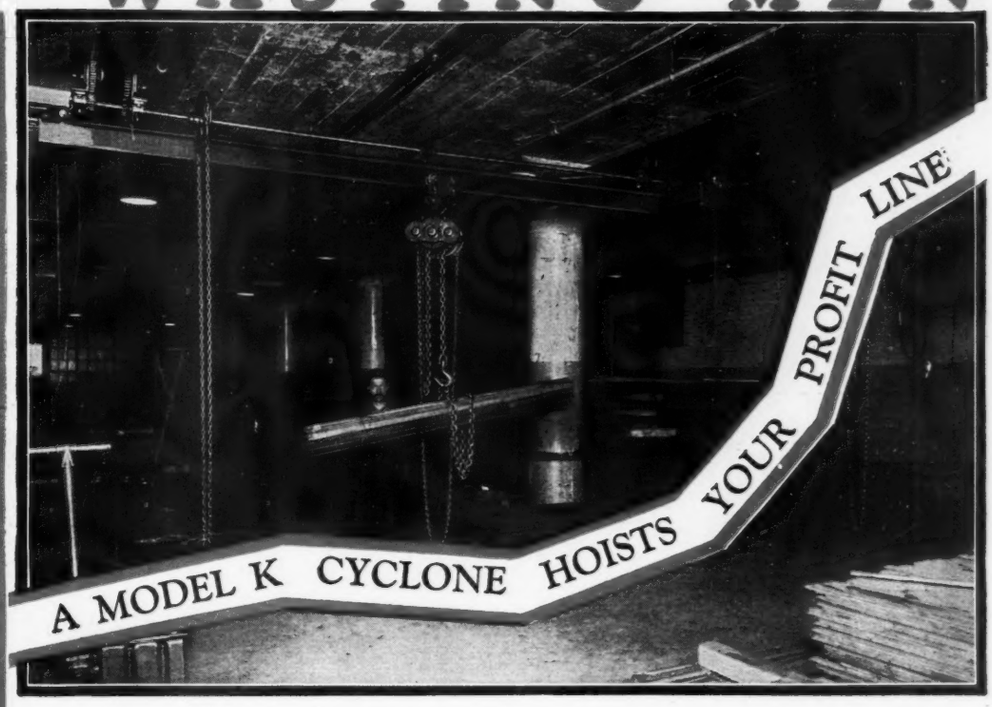
Double I-Beam Crane



Matchless Trolley



Low Head-room Hoist



Longest-Lived Without Repairs

THAT'S the Model K Cyclone Hoist. Anti-friction bearings in all moving parts reduce friction to a minimum.

Special alloy steels in load wheel and gears protect against the wear of constant use—insuring maximum safety.

The grease packing in the dust-proof, oil-tight housing, keeps every part thoroughly lubricated.

The exclusive gyrating yoke principle keeps two-thirds of the teeth in mesh at all times—another important safety feature.

These are some of the exclusive construction features of the new Model K Cyclone that make possible the remarkable long-life showing of this hoist in competitive tests—tests which have proved the Model K to be the most efficient, most economical and longest-lived light-weight, high-speed chain hoist ever built. The coupon will bring you complete information.

THE CHISHOLM-MOORE MANUFACTURING CO.
5002 Lakeside Avenue, Cleveland, Ohio
Branches: New York Philadelphia Chicago Pittsburgh
Representatives in all territories for prompt service

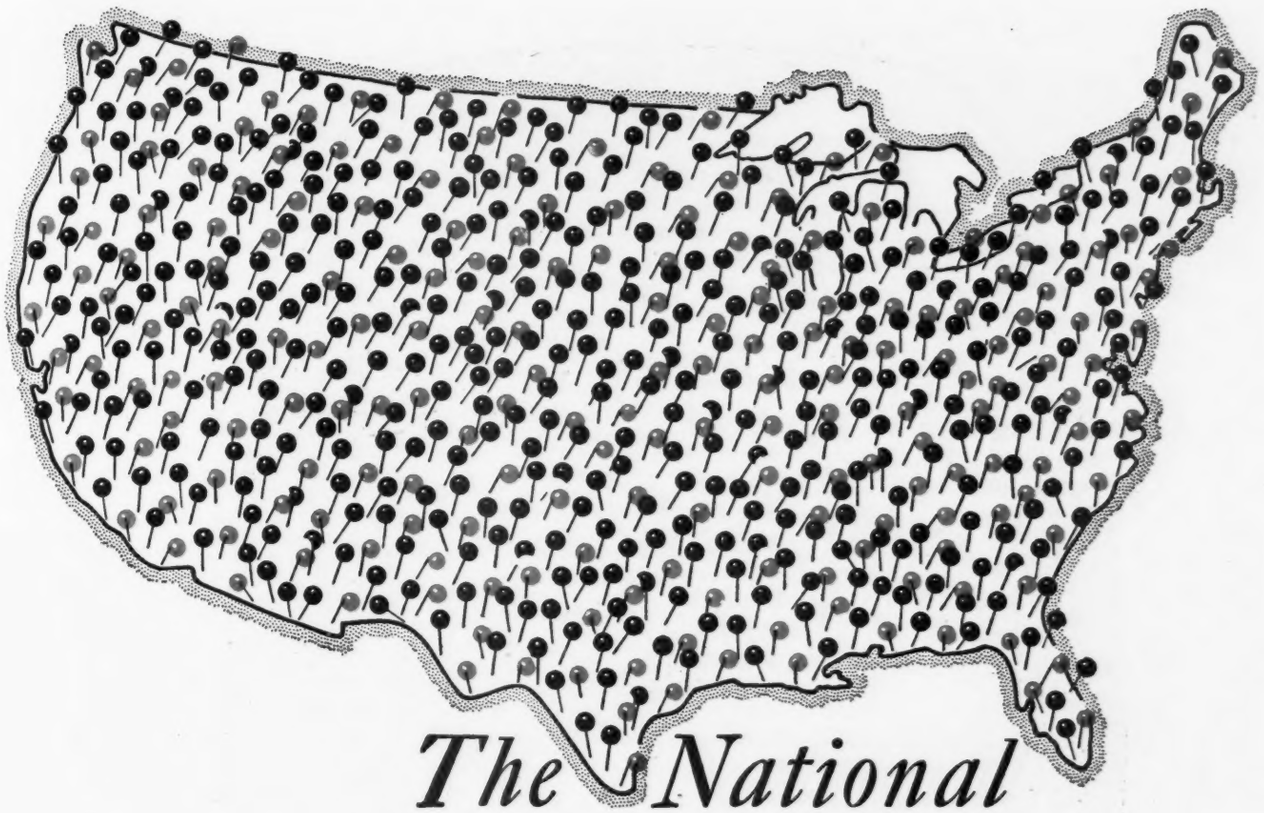
CHISHOLM-MOORE
CHAIN HOISTS — CRANES TROLLEYS CUPOLA CHARGERS — ELECTRIC HOISTS

The Chisholm-Moore Mfg. Co. 5002 Lakeside Ave, Cleveland, Ohio
Gentlemen:
Please send information on:
☐ The Model K Cyclone.
☐ Increasing plant efficiency through Overhead Material-Handling.

Individual .....
Company .....
Address .....
City ..... State .....

GET A C-M IDEA

Protect the Vital Units
MANY vital units of the automobile—battery, generator, and plugs, horn, starter and lights, are entirely dependent upon the cable system for their successful operation.
Trouble in the cable system is extremely annoying. It is difficult to locate and is frequently the cause of grief that is charged against the car itself. Packard Cable is standard factory equipment on most of the world's quality automobiles. The reason is obvious.
PACKARD CABLE
The Packard Electric
Packard
is never seen except on goods of honest value
Company Warren Ohio



The National Automobile Show-ing

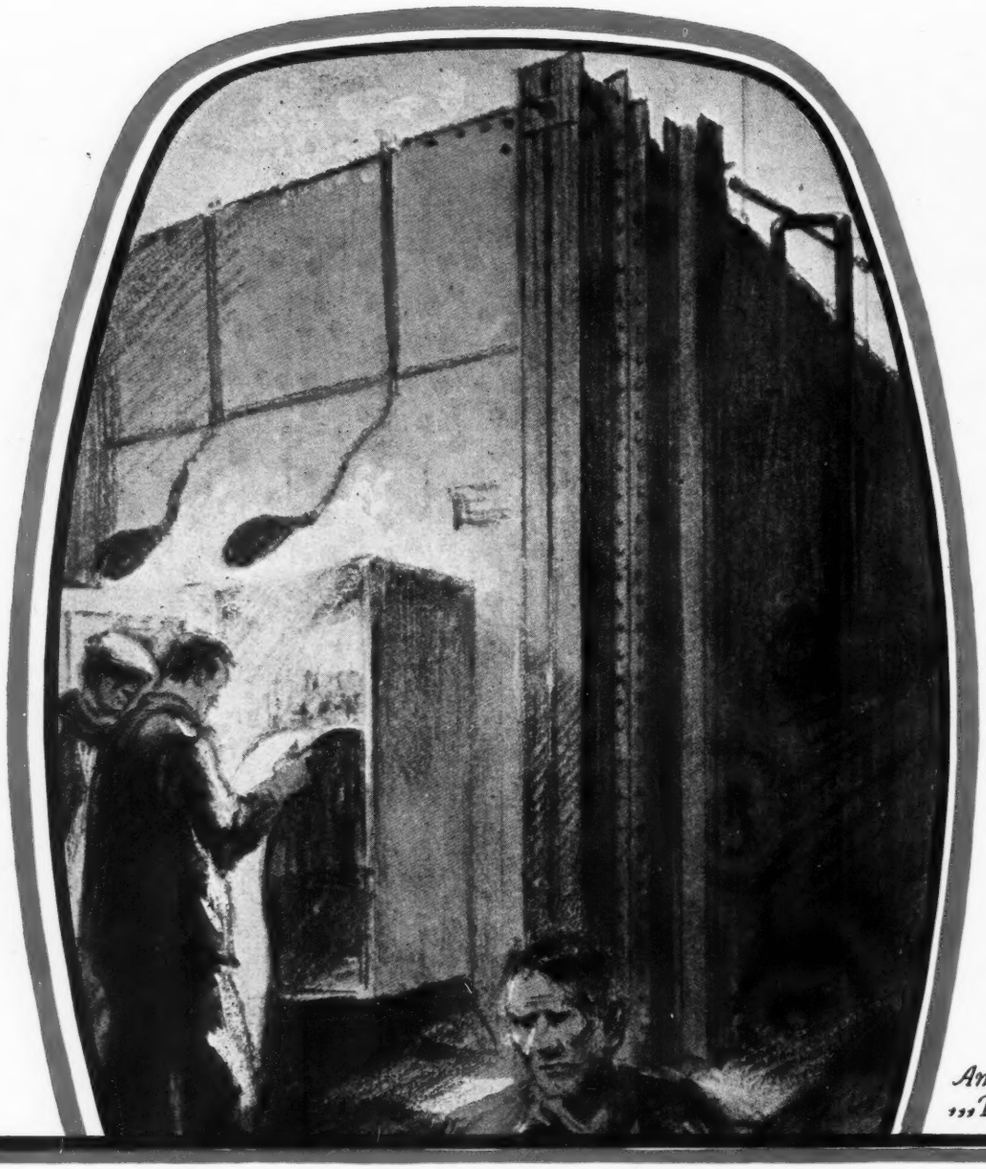
The Carter show is on the nation's streets and roads; in the assembly lines of the great makers; and in the national automotive statistics for 1927.

Again more than one-third—*nearer a half!*—of the entire year's production was Carter-carbureted.

Carter more than maintained its pace, by recognizing that increased acceptance involves increased responsibility. Product and service were still further improved, that Carter-equipped cars might run and sell still better, and always stay well sold.

CARTER CARBURETOR CORPORATION, SAINT LOUIS
DIVISION OF AMERICAN CAR AND FOUNDRY COMPANY

CARBURETER



Annealing Furnaces
,,,Pyrometer Control

The Latest Equipment

,,, a new mill ,,, but back of it all ,,, Experience

• • • • • From billet dock to shipping dock, the new Illinois Alloy Steel Mill is fitted with the most improved equipment money can buy, but equipment alone doesn't make dependable alloy steel. It must be mixed with *Experience.*

• • • • • Every man of importance in the alloy department of the Illinois Steel Company is seasoned in the art of quality steel production. Each is charged with his share of the responsibility of producing steel that is chemically and physically in accordance with specifications. • • • • • • • • You will find this *a dependable source of supply.*

Illinois Steel Company
Chicago

ILLINOIS *Alloy* STEEL

What can YOU *tell* by looking at a piston ring?

Can you look at a piston ring and *tell* whether its good or bad? PERFECT CIRCLES *look* like good piston rings . . . and so do a lot of other rings. Appearance alone will never tell the real worth of *any* piston ring, for good rings and bad rings look much alike.

The *difference* in PERFECT CIRCLE Piston Rings lies in the *hidden qualities* that are built into the ring through years of research and improved manufacturing processes . . . characteristics that become a part of these better piston rings all along the route, from pig iron to finished product. You can't see them . . . you may never know they are there . . . but they have much to do with PERFECT CIRCLE'S superior performance.

Our engineers, laboratories, and valuable experience in re-designing ring equipment for leading manufacturers, are at your service.

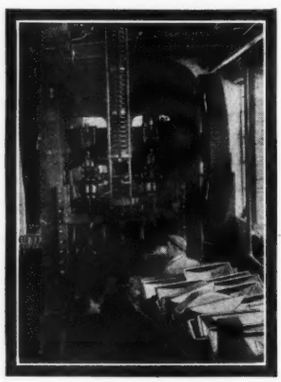
THE PERFECT CIRCLE COMPANY
HAGERSTOWN, INDIANA

PERFECT CIRCLE
PISTON RINGS

producing deep, difficult **stampings**

—*on a single action press*

Looking at the shell shown above (drawn from .21 brass), most practical pressed metal men would say that to produce it satisfactorily would require a double action press and a comparatively slow rate of production, *yet this part is being produced today at the rate of 14 shells a minute on a Bliss No. 7 single action press*—and every shell comes out strong and smooth, free from cracks and wrinkles.



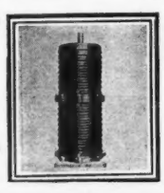
This combination of rapid production of perfect shells with low operating cost is made possible by having the single action press equipped with Marquette Air Cushions. These Cushions furnish firm, even pressure to all parts of the blank at all stages of the draw, enabling the single action press to do the work of a double action, at the same time saving wear and tear on dies and presses — and making change-over to other work or regulating pressure, a much shorter and simpler job.

Suggestion: If you are interested in getting the utmost out of your equipment, send samples or blue prints of the parts you make to our Engineering Department and see if they can't show you a way to reduce number of operations, speed up production and cut your costs on some job. Hundreds of firms have found this a short cut to less costly, more efficient production of pressed metal parts.

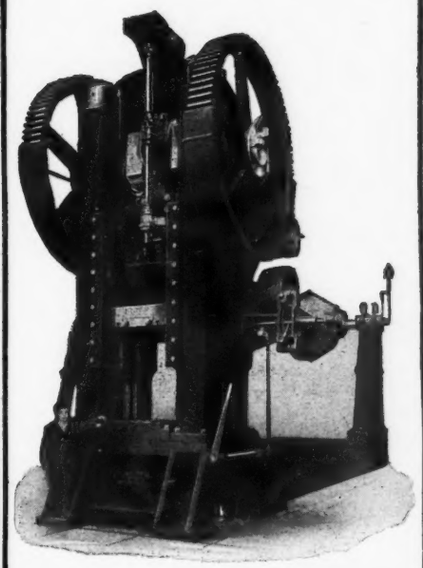
Address correspondence to Chief Engineer—

Marquette
TOOL & MFG. CO

1912 North Kilbourn Ave.
CHICAGO ILLINOIS



BLISS



BLISS

Straight Side Presses

Sheet metal automobile parts, heavy hardware, agricultural implements, tractors, electrical instruments, cutlery, etc., can be turned out with a high degree of precision and economy by the aid of Bliss Straight Side Presses. This type of press is also adapted to light embossing work and the trimming of hot or cold forgings.

The Bliss Straight Side Press is built in a wide variety of arrangements so as to meet given operating requirements exactly. It can be furnished with flywheel, single, double, or triple geared, single or twin drive, cut back or straight side frame, special slide width and length, etc.

There is a Bliss Press that meets *your* requirements exactly. Let us check your sheet metal operations and explain the advantages of Bliss equipment in your plant.

E. W. BLISS CO. MAIN OFFICE AND WORKS BROOKLYN, N. Y., U. S. A.

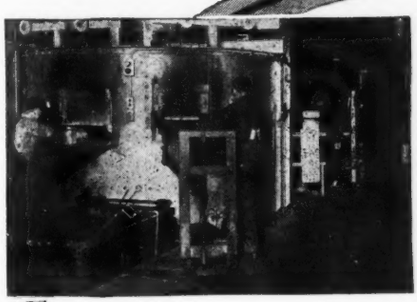
Sales Offices: DETROIT General Motors Bldg. · CLEVELAND Guarantee Title Bldg. · CHICAGO 4500 Cortland St. · BOSTON Weld Bldg. · ROCHESTER Times Union Bldg. · CINCINNATI Union Trust Bldg. · NEW HAVEN 2nd National Bank Bldg. · PHILADELPHIA Pennsylvania Bldg.

American Factories: BROOKLYN, N. Y. HASTINGS, MICH. SALEM, OHIO CLEVELAND, OHIO

Foreign Sales Offices and Factories:

ENGLAND: Pocock St., Blackfriars Rd., S. E., London. Norwich Union Chambers, Birmingham. FRANCE: 54 Blvd. Victor-Hugo, St. Ouen, Sur Seine, Paris.

No. 441



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Unexcelled heat treating and laboratory facilities

Supplementing complete drop-forging equipment, our heat-treating and sand blasting facilities assure absolutely dependable and clean forgings.

A highly trained staff in charge of our own chemical and physical laboratories check and test all materials and product. All Williams' forgings are guaranteed.

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SUPERIOR DROP-FORGINGS
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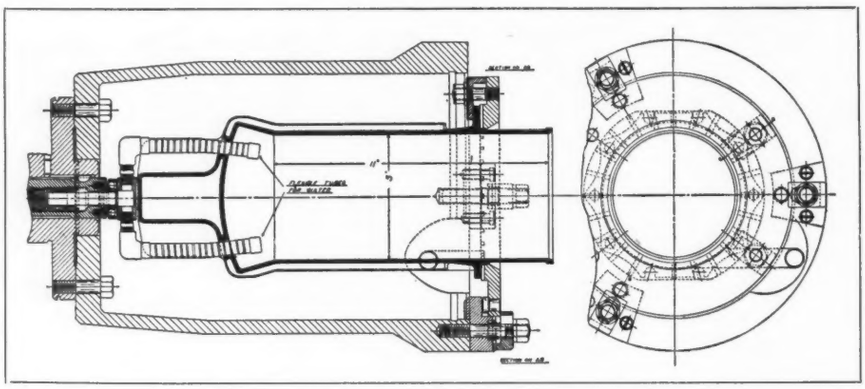

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SIZE OF WORK ..... 4½″ x 9″
STOCK TO REMOVE ..... .040″ Plus
TOLERANCE ..... .001″
PRODUCTION ..... 2 Per Hr.

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The Grinder With One Slide Only

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VT., U.S.A.

TEN YEARS GROWTH

The last ten years has seen such an advance in high speed machine tool operations that production has more than doubled.
Step by step with this increased machine production, the

Wyandotte
Clean "Chemically" Clean
Metal Cleaners

have matched every advance in production schedules because of their ability to clean "chemically clean" at a minimum of time, labor and cost.
There is no more certain way of placing your metal cleaning operations on a basis of definite results and costs than to ask your supply man for Wyandotte Metal Cleaners.

Ask your supply man for

"WYANDOTTE"

The J. B. FORD CO., *Sole Mfrs.*, Wyandotte, Michigan

The NEW PULLMORE INDUSTRIAL CLUTCH

COMPACTNESS POWER

Long Life--Fool Proof

specially adapted for main drive clutch for machine tools — rapid traverse clutch — feed clutch — counter shaft clutch — line shaft clutch for disengaging machines from line shaft.

Easily Attached to any Machine—Made in six sizes—single and double types—from 7/8" up to 2¼" shaft diameter. One model operates in oil and one dry. Both perform efficiently.

Fills a long needed want in the industry. It is a small clutch of great power. Made entirely of steel, hardened and heat treated.

The Strongest Clutch Made for Its Size—

In rating the New PULLMORE CLUTCH a work factor of 16 is used. For instance the No. 3 clutch is rated at 5 H. P. at 500 R. P. M., while it actually will pull 80 H. P. without slipping.

Write today for complete details.

Unequalled for any machinery applications where it is desired to disengage one rotating member from another.

Illustration shows NEW PULLMORE No. 3 DOUBLE CLUTCH which may be used in nest of beveled gearing for reversing purposes. Actual size 3¼" in diameter by 5 15/32" long.

We also manufacture the Rockford Automotive Clutch.

ROCKFORD DRILLING MACHINE CO.
ROCKFORD ILLINOIS

Announcing LOWER CONVEYOR OPERATING COSTS

Made possible by a conveyor chain possessing distinct advantages

Showing construction of the MORCO chain

THE stamina of drop forged construction gives the Morco chain great strength. At the same time the patented design makes it light. You really receive more strength with less weight. The subsequent power saving will help make a cut in your conveyor operating costs. The Morco chain can be adapted to any design of conveyor used by the automotive industry, including chassis assembly, body trim, paint conveyors, fender enameling, etc. Specially designed links furnished to specification. Write for further details.

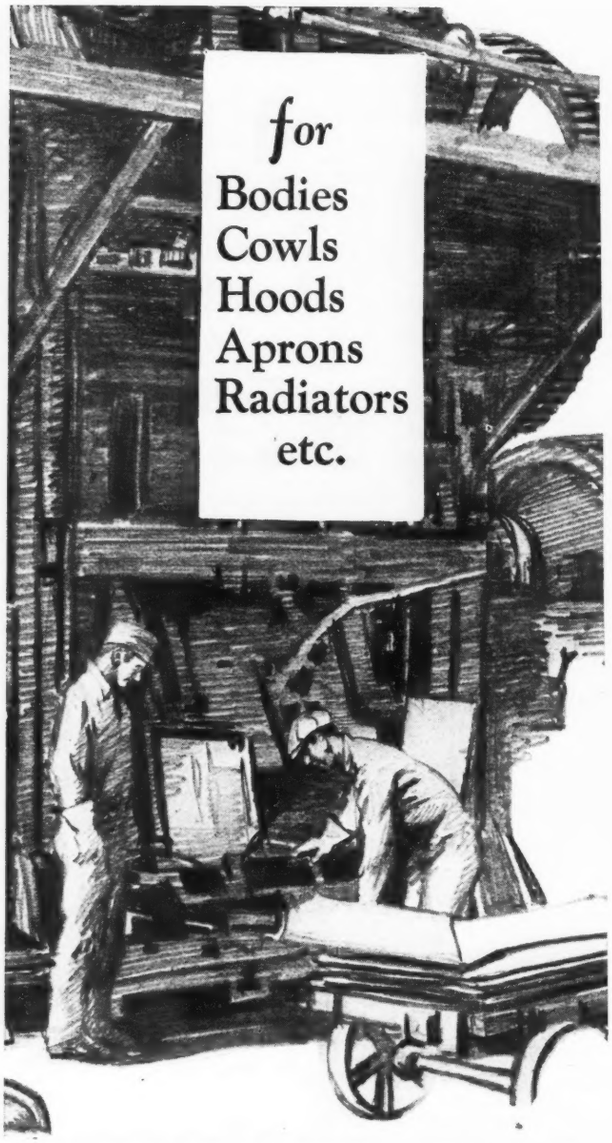
MORCO PIECE Trade Mark Registered

DROP FORGED CONVEYOR CHAIN

Patented

MOORE DROP FORGING COMPANY, Springfield, Mass., U. S. A.

Detroit Office, 4-255 General Motors Building



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Shipments from Buffalo — with her unrivaled facilities by rail and water for reaching all sections of manufacturing America and Canada.

A mill of 10,000 tons a month capacity, each sheet of which must meet your specifications to the letter.

Let us work with you toward the solution of your specific sheet problems.

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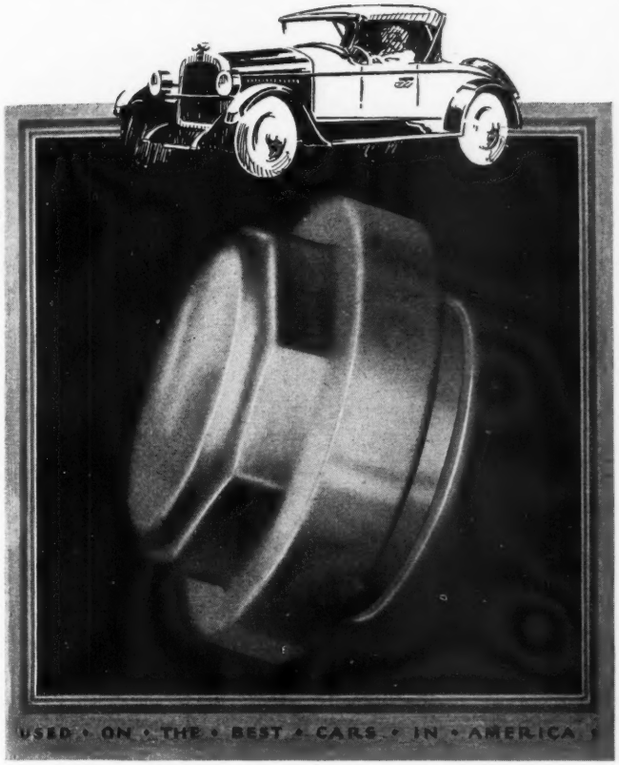
because—
it devotes itself wholly and entirely to automotive problems:

because—
everything they read between its covers is pertinent to their daily work, and specifically related to the great industry of which they are a part.

The Logical Advertising Medium

for builders of machine tools and plant equipment who wish to reach buyers *throughout* the automotive field



HUB CAPS

MADE IN ANY METAL—IN ANY FINISH

by the Rockford Metal Specialty Company are standard equipment on the world's leading automobiles. They combine quality and durability and in design are an instant and focal point of beauty in automobile appearance.

Rockford Quality Hub Caps are produced in any quantity.

ALSO—Automobile Hardware *and* Difficult Stampings

for Exacting Manufacturers

Write or wire today. Our engineers will be glad to estimate on your requirements.

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SPECIALTY COMPANY
Stamped Metal — *Products*
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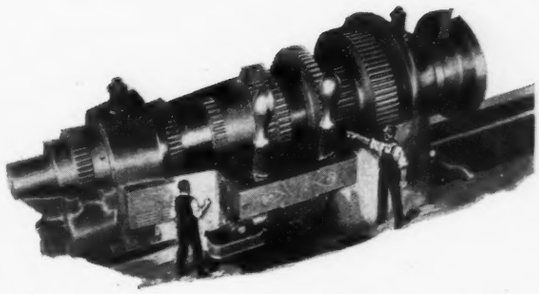


Let's get inside of this!

IT is the "heart and nerve and sinews" of the Model B Lathe—this headstock.

Within are gears! Not just ordinary-toothed gears, but gears with teeth shaped to theoretical perfection (Maag Gears) hardened and ground to a strength and accuracy that almost defies belief (tensile strength over 250,000 lbs.).

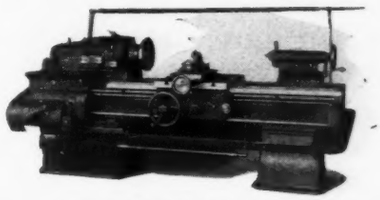
How smoothly they run! What a steady business-like hum as they run in their oil bath. What if the cutting tool is given a big cut of tough steel! The gears can't slip (as a belt might) even with the terrific initial shock on the persistent load of a rough cut.

And when the operator wants a fine cut with a shaving as thin as paper—how evenly and delicately the ribbon of steel unrolls.

How can a cone-driven lathe compare with this gear-driven masterpiece?

There is a life-time of study in this geared head. It is yours to use for greater lathe production at a much-lowered cost.

Let us send you the whole story, mechanical and financial, of this wonder lathe. If you prefer it, a Pratt & Whitney sales engineer will come to you. From blueprints of your work or actual samples we will gladly make time studies and give you the results. Write.



P & W Model B Lathes are made in 3 sizes—13", 16", and 20". Which size fits in with your needs? Ask us for details.

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Division NILES-BEMENT-POND COMPANY
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SPEED-UP BLACK BAKING JAPAN

BAKES IN 20 MINUTES

AT 400° FAHRENHEIT

Speeds up production—lowers costs—increases profits.

Particularly adaptable for conveyor type of oven.

Hilo *Speed-Up* Blacks produce an exceptionally deep black coating of great durability.

Made in gloss, semi-gloss and dull finish.

Make a test of Hilo *Speed-Up* Blacks under your own working conditions. We will send sufficient quantity, gratis.

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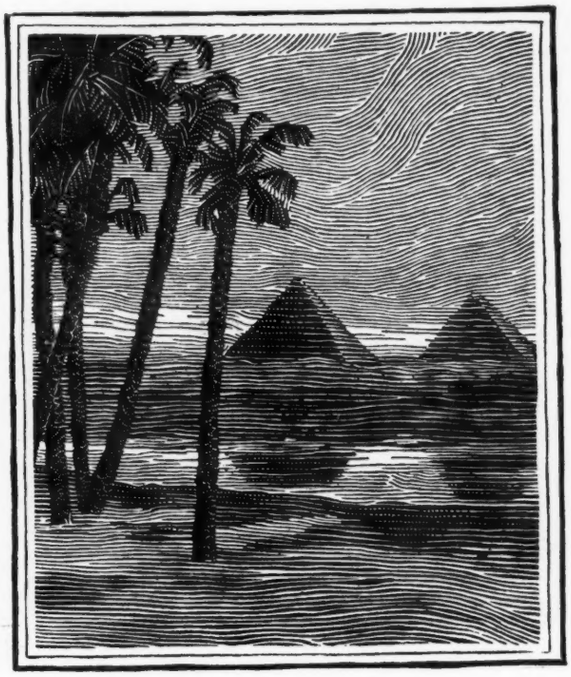

"CJB" Master Ball Bearings

The quiet, almost frictionless, performance of CJB bearings is the result of the infinite care and exacting tolerances required in their manufacture.

The closest approach to ball bearing perfection that modern machinery and expert craftsmanship can produce.

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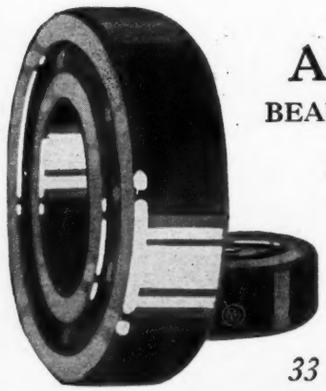

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This automobile has now been made by the Austin Motor Company, Limited, in England, for over four years, and is produced in larger numbers at the present time than any other single model in production in that country.

The Austin Motor Company, Limited, are in a position to supply all the necessary designs and data to ensure successful working right from the commencement.

The rights for the manufacture of the "Austin" automobile have been taken up by a powerful group in Germany and the licencees are already in active production.

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Correct Chassis Lubrication

Gits Chassis Oilers
are constantly replacing grease fittings because they
DO IT BETTER

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Accessories That Last the Life of Your Car

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Every truck and bus needs this safety auxiliary wiper when automatics go wrong. Made from steel, heavily nickled: double weight live rubber. *Two models*—heavy "Despatch" and light "Junior"

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In springs you get what you pay for. The price savings obtainable in cheaper springs are wiped out by a higher cost to use — not to mention the penalties inflicted on the car's reputation. Mather is the emphatic choice of those who know by experience that quality pays.

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Makers of scientifically heat treated springs for automobiles

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Ricardo Head
Four and Six Cylinder Heavy Duty Bus and Truck Engines
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For Heavy Duty Dual Pneumatics
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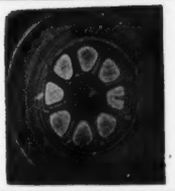
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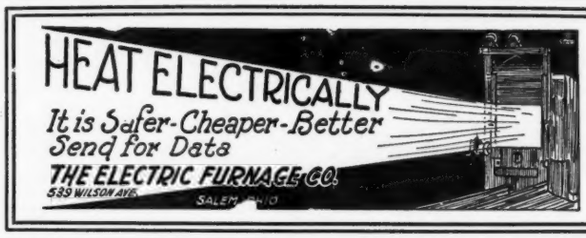

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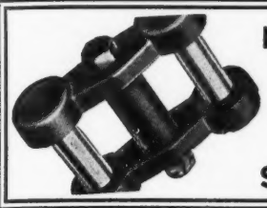

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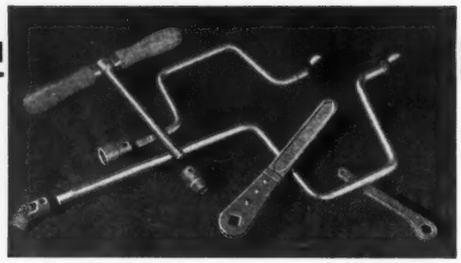

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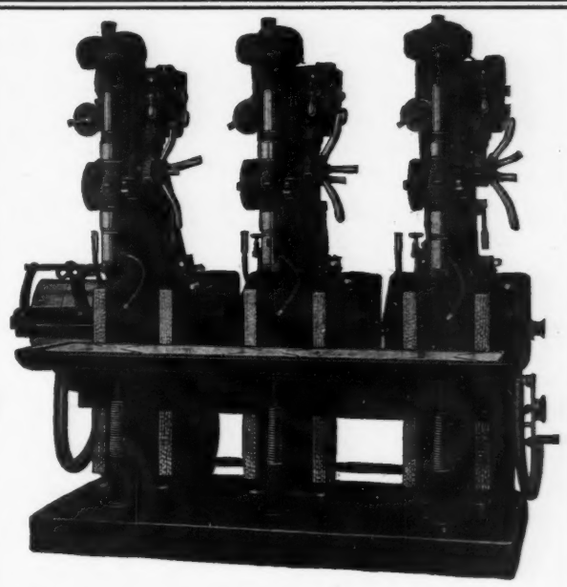


Production Plus—

This 3-Spindle Gang Self-Oiling and All-Geared Drilling Machine not only turns out the work in a hurry but does its work perfectly. Best of all, this drill has strength to continue this performance indefinitely. Send for Catalog "E".

BARNES DRILL CO.

817-847 Chestnut St., Rockford, Ill.

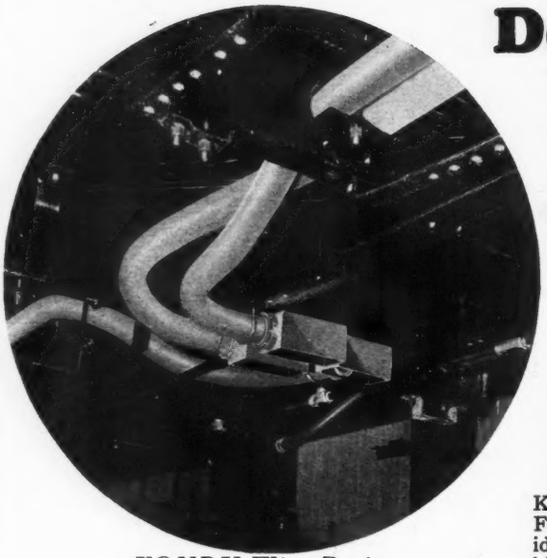
These Bulletins Will Interest You

They describe and illustrate various types of gas, electric and oil heated ovens, also special types of conveyor ovens used in connection with automatically dipping and baking small and large parts. Volume production in enameling, japanning and lacquering is the paramount idea back of Maehler Ovens.

May we send you these bulletins?

The
PAUL MAEHLER COMPANY
Industrial Oven Builders
2212 W. LAKE ST. CHICAGO, ILLINOIS

KONDU-BOX



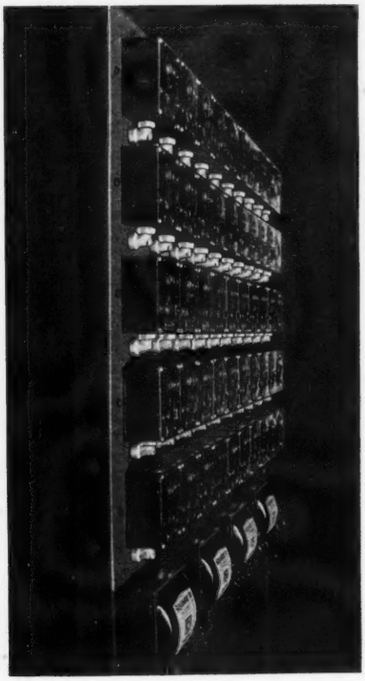
KONDU Wins Praise From Steel Car Builders

Don't Let That Next Conduit Job Worry You

Figure your total costs when figuring conduit installation cost and you will find time your biggest item.

Whether the job is complicated or not it can be done with a great savings by using KONDU THREADLESS FITTINGS.

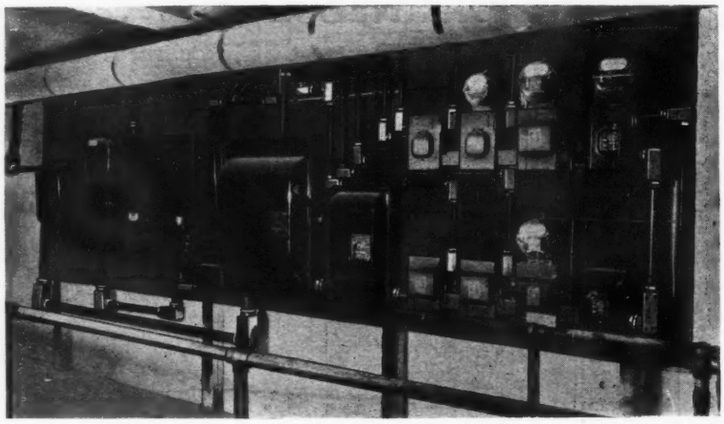
KONDU THREADLESS FITTINGS are not merely an idea but the solution to the high cost of conduit installations.



In a Large Coal Company's Cleaning Plant

90° Knockout box connector (Type KOL) on a Master Control Panel.

KONDU proved their time and labor saving qualities on this job.

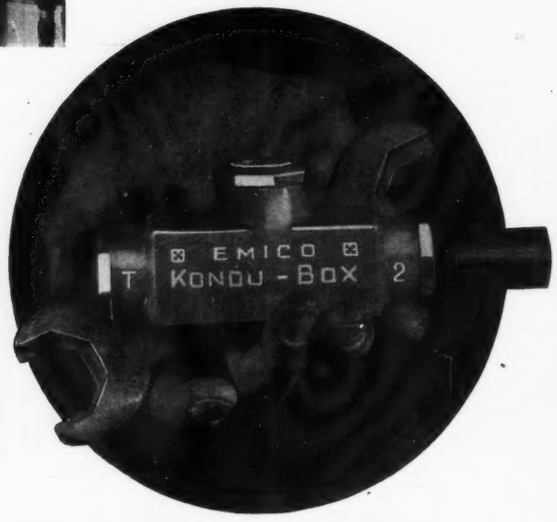


In a Large Western Storage Plant

Placed there with less time and labor than possible with threaded fittings.

A good arrangement, economically installed, and yet, any box can be changed in a few minutes if desired.

This Outfit and New 1928 Catalog FREE Upon Request



THE THREADLESS CONDUIT FITTING

Thirty-Five Hundred Satisfied Users of KONDU THREADLESS FITTINGS

In every field of Industry; Iron and Steel Mills, Mines and Quarries, Railroads, Central Stations, Power Plants, Car Builders, Oil Refiners, Chemical Plants, Etc., Etc.

Erie Malleable Iron Company

Kondu Division **Erie, Pa.**

Don't let 'em kid you!

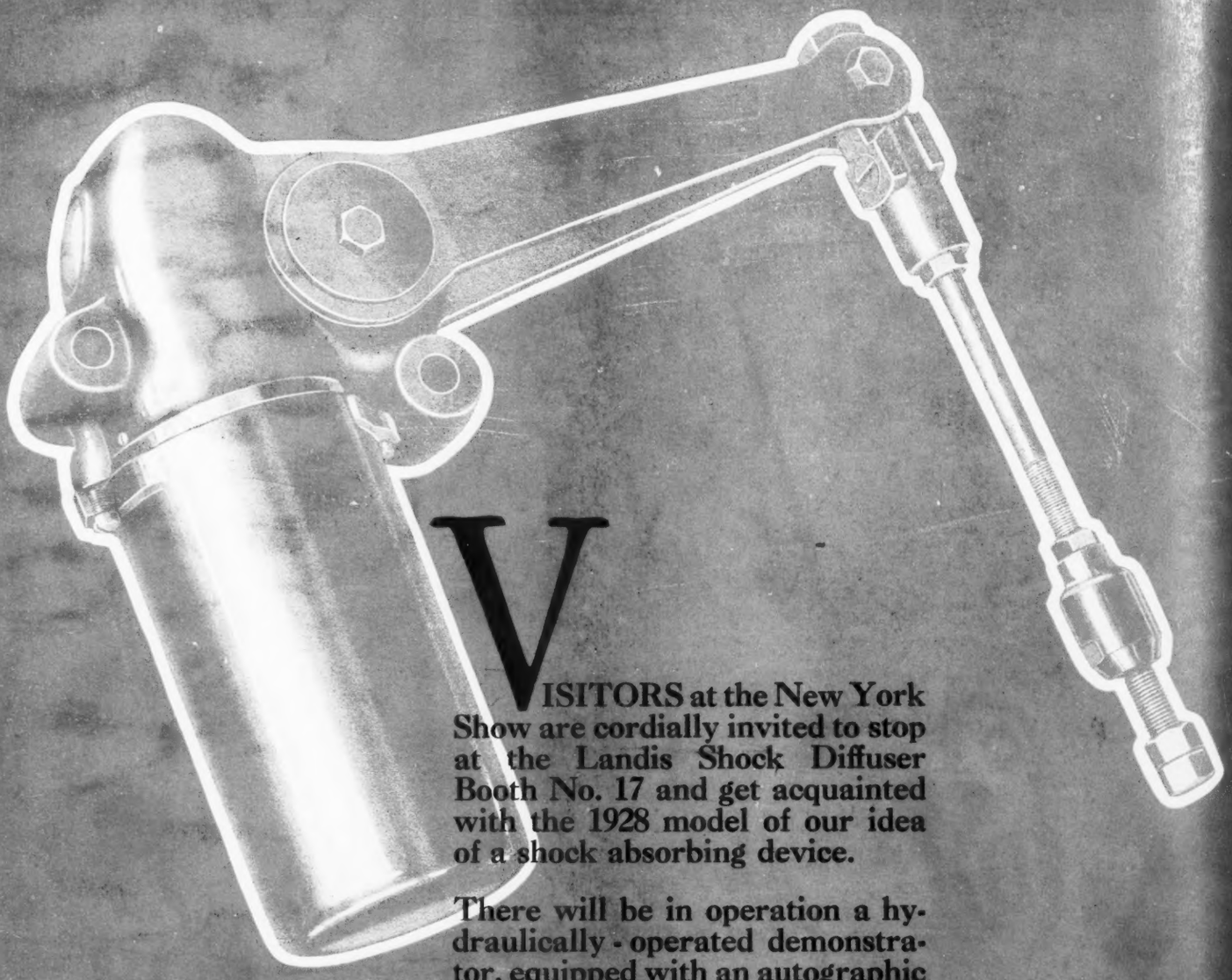
You don't have to be an ignition expert to know for a certainty that there's no substitute for a Stackpole Brush in your automotive brush replacement, especially when you know that Stackpoles are made for the job to the order of the automobile manufacturer.

So when making carbon brush replacements don't let any repairman hand you that hocum about "this brush is just as good as Stackpole".

Insist on the same make and grade of replacement brushes as those originally installed by the manufacturer of your automotive equipment and see that you get them.

STACKPOLE CARBON COMPANY
ST. MARYS **PENNA.**

Stackpole carbon brushes



VISITORS at the New York Show are cordially invited to stop at the Landis Shock Diffuser Booth No. 17 and get acquainted with the 1928 model of our idea of a shock absorbing device.

There will be in operation a hydraulically-operated demonstrator, equipped with an autographic chart mechanism. This will enable spectators to carry away with them actual graphs of spring compression and recoil—WITH and WITHOUT benefit of *true* hydraulic spring control.

Visitors may also make arrangements for samples, for use on their test cars.

LANDIS ENGINEERING & MFG. CO.

Automotive Division

Established 1913

Waynesboro Pennsylvania

The LANDIS *Shock Diffuser*